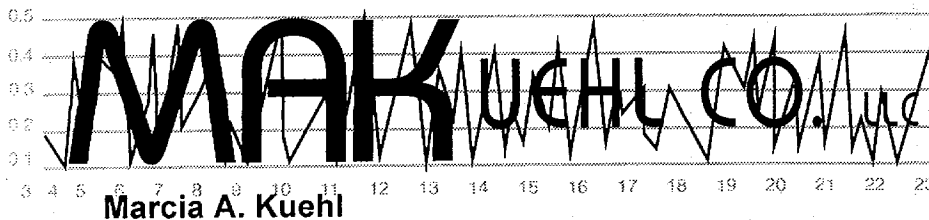


APPENDIX B

DATA VALIDATOR AND RISK ASSESSOR QUALIFICATIONS

APPENDIX B1
MAKUEHL CO.



Data Validation

Lab/Field Audits

QA Plans

JUN 14 2006

Marcia Kuehl is an environmental chemist and manager with over 25 years of experience in laboratory analysis, environmental data collection, quality assurance and data assessment. She was involved in the early development of the EPA Contract Laboratory Program and subsequent data validation protocols. Currently, Ms. Kuehl is the President/Owner of an environmental consulting firm, the MAKuehl Company. Ms. Kuehl performs and manages the multiple tasks of data validation, laboratory and field audits and assists engineering firms in Quality Assurance Project Plans (QAPP) and Data Quality Objectives (DQO) development.

Ms. Kuehl's educational background is in chemistry, with environmentally focused graduate research in the maternal transfer of PCBs conducted while pursuing her Master's of Environmental Arts and Sciences (M.E.A.S.) degree. In order to conduct this research, she was responsible for developing the analysis method, statistical design and quality assurance program to provide defensible data. This experience was invaluable in her QA role at U.S. EPA. She recently completed her M.S. in Environmental Science and Policy thesis titled "Polychlorinated Biphenyl Congener Patterns in Lake Michigan Mass Balance Study Biota".

Ms. Kuehl has written and reviewed **technical guidance** documents during and after her tenure at EPA. Ms. Kuehl was involved in establishing the DQOs for the Region V Dioxin study with Dow Chemical, and was subsequently asked to join the National Dioxin QA Task Force. The first protocols for EPA regional data validation of Contract Laboratory Program (CLP) were written by Ms. Kuehl, and her involvement in the CLP technical caucuses dates from their inception. Ms. Kuehl developed the DQO process that Donohue and Associates followed for its assigned EPA Region V ARCS contract RI/FS investigations.

Ms. Kuehl has provided for **implementation of QA programs** through her creation of laboratory QA programs for the EPA Central Regional Laboratory and two commercial laboratories. Ms. Kuehl led all scoping meetings involving environmental measurements to guide staff in appropriate DQO selection. Field Sampling Plans as well as Quality Assurance Project Plans were either written or reviewed by her for all federal lead projects.

Ms. Kuehl has proven **skills in communicating** technical information to professionals and the public. She has conducted training for attorneys, geologists, and engineers in the principles of environmental QA from the DQO process through sample collection, analysis and evaluation. Ms. Kuehl has trained EPA subcontractors and state environmental personnel in data validation, statistics, and writing QAPPs. Integrating these subcontractors into project teams and monitoring the quality of their work was her responsibility. Ms. Kuehl has presented technical issues and findings at national and regional meetings of the American Chemical Society, American Society for Quality Control,

Water Environment Federation, American Institute of Chemical Engineers and the EPA.

Ms. Kuehl has had over 24 years experience in **conducting on-site audits** of environmental laboratories. She has audited over 15 laboratories providing analytical data under contract to the EPA Contract Laboratory Program, and an additional 14 laboratories that provided analytical data in support of remedial activities and RCRA monitoring programs. She has audited EPA ORD and industrial laboratories conducting ultra-trace level analyses for polychlorinated dibenzofurans and polychlorinated dibenzodioxins for the EPA National Dioxin Study. Most recently she has audited eight federal, state, university and commercial laboratories providing ultra-trace level analyses of congener specific PCBs for the EPA Lake Michigan Mass Balance Study and the seven contract laboratories for the Hudson River Contaminant Assessment Reduction Program. She has been retained by several laboratories to conduct "pre-audits" of them prior to their EPA and/or State audits, and she provides several engineering firms with "capacity and capability" audits of laboratories they are considering for large monitoring projects. She has also worked with a laboratory decertified by the State of Wisconsin in correcting deficiencies and successfully re-applying for certification.

Ms. Kuehl has **implemented automated data verification processes**. As QC Coordinator for the Lake Michigan Mass Balance study, she was responsible for review of all of the organic contaminant data in air, water, sediment and biota. As data was submitted to the EPA, she reviewed each spreadsheet for compliance with the electronic data standard reporting format and the researchers Measurement Quality Objectives. Data was then converted for loading into the data verification program, Research Data Management Quality Control System (RDMQ) developed by Environment Canada. She conducted data verification through RDMQ by the QC Coordinator, and resolved data quality and reporting issues with the laboratory. She worked with Booz Allen & Hamilton to create an automated data verification program for the PCB, pesticide, PNA, dioxin/furan and metals data collected for the Hudson River Contaminant Assessment Reduction Program.

Ms. Kuehl has **validated analytical data** for over 25 years, beginning in the infancy of the EPA Contract Laboratory Program in 1980. She was one of the EPA representatives that met quarterly with the CLP laboratory community and EPA research chemists to refine both the reporting and technical requirements of the CLP from 1980-1984. During her career she has validated data from Superfund sites, RCRA RFI sites and DOD sites for over 10,000 samples. Since 1995, she has validated PCB data for over 2,500 samples collected from the Fox River for the DNR, engineering firms and the paper industry.

Ms. Kuehl's involvement and input into the field of environmental quality assurance are documented and known to her peers. The experience and knowledge Ms. Kuehl holds will enable her to provide data validation support to NRT.

APPENDIX B2

EXPONENT



Statement of Qualifications

Environmental Risk Assessment Consulting Services for Wisconsin Public Service Corporations, Peoples Gas Light and Coke Company, and North Shore Gas Company Former Manufactured Gas Plant Sites



Prepared for

Integrus Business Support LLC
Chicago, Illinois





Statement of Qualifications

Environmental Risk Assessment Consulting Services for Wisconsin Public Service Corporations, Peoples Gas Light and Coke Company, and North Shore Gas Company Former Manufactured Gas Plant Sites

Prepared for

Integrays Business Support LLC
Supply Chain Services
700 N. Adams
Green Bay, WI 54307

Prepared by

Exponent
1800 Diagonal Road, Suite 300
Alexandria, VA 22314

August 2007

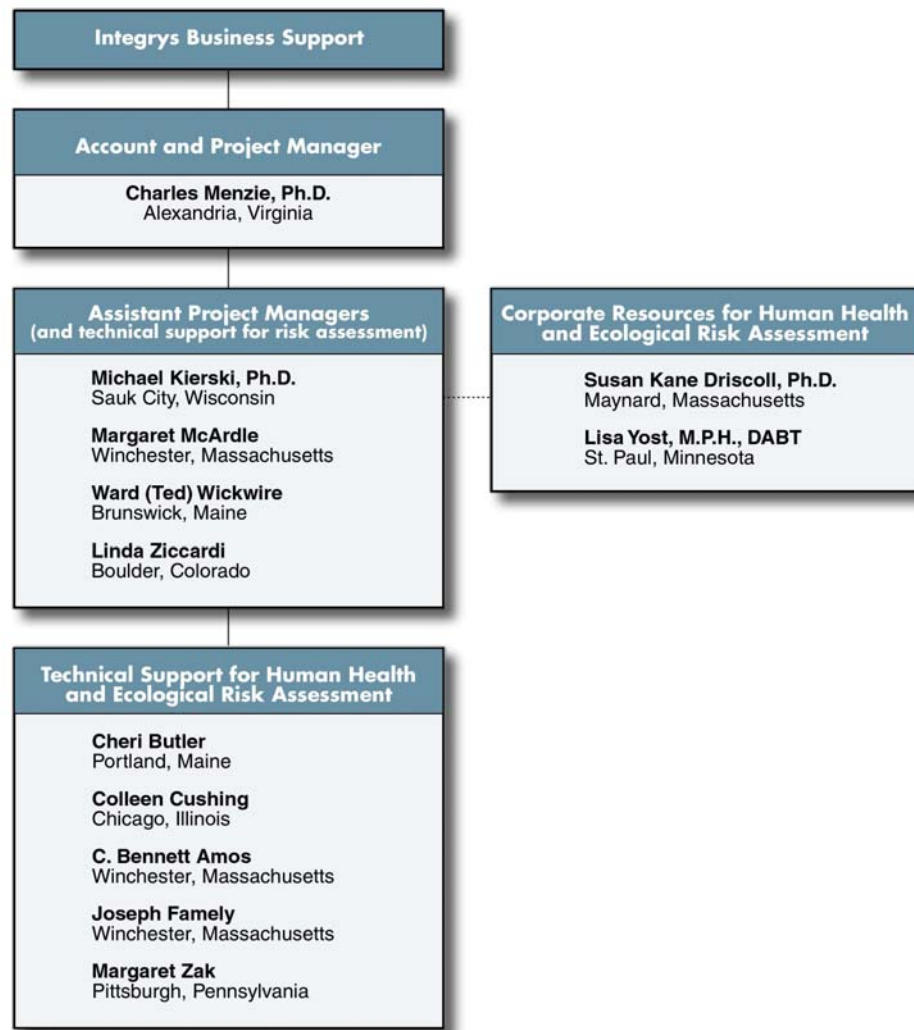
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Project Team and Organization Chart

Exponent's Project Team is shown in the organization chart below. The Account and Project Manager will be Dr. Charles Menzie, who is nationally recognized as a leader in the field of human health and ecological risk assessment and has a unique combination of experience with both upland and aquatic environments. He has worked on all risk issues at MGP sites and has worked on more than 40 MGP sites throughout his career. He will use his breadth of experience to assist Integrlys to develop streamlined and cohesive approaches to be implemented across MGP sites. This will reduce costs associated with coordinating the many elements of a project. This will also make it possible to conceptualize strategies that can lead to the most cost-effective approaches for sites. Dr. Menzie will be supported by Exponent staff with extensive MGP experience. Collectively this team will be able to efficiently complete the work and deliver the type of support services that Integrlys Business Support, LLC (IBS) and the agencies need to support decisions.



Dr. Menzie will assign assistant managers to each site to help him with the day to day management and execution of the risk assessment project. However, he will be the main contact for Integrys on all of the MGP sites and the main point of contact with the remedial investigation companies and regulatory agencies. Each of the assistant project managers has 10 or more years of risk assessment experience and some, like Dr. Kierski, have worked in the field for 20 years on numerous MGP sites. Many of the assistant managers have extensive experience with USEPA Region 5, State of Wisconsin, and Illinois risk assessment staff.

The assistant project managers will not only perform day to day management of the projects, but will be technical resources on the MGP site that they work on. These assistant managers will be able to draw upon technical support staff to complete the risk assessment tasks at each MGP site. In addition, they will be able to draw on other corporate resources for specialized support including strategy support and specialized technical input. Dr. Susan Kane Driscoll will be available to assist with issues related to the bioavailability of PAHs in sediment and provide peer reviews of the ecological risk assessments. Ms. Lisa Yost will be available to assist with strategy on human health risk assessment issues and provide peer reviews of the human health component of risk assessments. Resumes for team members are provided in Attachment 1.

Exponent staff work well within virtual teams where staff can be in their respective locations and contribute productively to the project. The main regulatory interface will be between Dr. Charles Menzie and the USEPA, WDNR, and IEPA staff. Dr. Kierski will be the main support for Dr. Menzie on the MGP sites in Wisconsin and Illinois, as he is centrally located within the footprint of the sites. He will accompany Dr. Menzie on the site visits and disseminate the information to other assistant managers and technical staff. This will allow Exponent to cost-effectively evaluate multiple sites as they begin the remedial investigation process.

Project Team Publications

A list of published papers, conference presentations, and research related to characterization of MGP sites and/or sediments prepared by the project team members is provided in Attachment 2.

Case Histories

Exponent has selected six cases studies to show the breadth of risk assessment experience we have. These case studies showcase past MGP experience, and USEPA-led NPL and RCRA site experience. We have included a case study about the work in which we are presently assisting WPSC and NRT within the Superfund Alternatives Site (SAS) program as this seems most applicable to Integrys' needs. We have highlighted the cost efficiencies or technical innovation that was used to achieve client-specific goals or objectives.

Table 1, which follows the case histories, identifies the proposed Integrys project team members who worked on the project and their role, the scope of services for each project, and the total fees invoiced to the client for those services. Table 2 presents representative experience of Exponent staff at MGP sites throughout the country.

Multi-site Risk Assessment Framework Document and Work Plan Support for the Wisconsin Public Service Corporation Manufactured Gas Plant Sites

Client: Natural Resource Technology, Inc.

Location: WPSC MGP sites in Wisconsin

Project Description: Exponent is assisting NRT on behalf of the Wisconsin Public Service Corporation (WPSC) in the development of a multi-site risk assessment framework (RAF) for six WPSC MGP sites. This RAF was prepared in accordance with the statement of work (SOW) attached to the Settlement Agreement and Administrative Order on Consent for the conduct of remedial investigations and feasibility studies (RI/FS) between WPSC and USEPA. In addition, Exponent is currently assisting NRT and WPSC with the development of site-specific remedial investigation work plans on two of the six MGP sites (i.e., Stevens Point and Manitowoc) that are covered by the Agreement with USEPA.

The RAF provides a consistent streamlined approach for performing baseline risk assessments (BLRA) at the six sites covered by the Settlement Agreement, and is designed to be consistent with USEPA risk assessment guidance. NRT, WPSC, and Exponent, through a series of working meetings with USEPA staff (and sometimes WDNR staff), have negotiated an RAF approach that meets each party's needs, but is streamlined in nature. While the RAF document uses a streamlined approach whenever possible, it also incorporates the ability to use the latest advancements in assessing risks at sediment contaminated sites (e.g., the incorporation of measurements of black carbon in sediments). During the negotiation process, Exponent staff supported NRT and WPSC in a strategy development meeting to educate USEPA on the pros and cons of using specific methods for evaluating the bioavailability of PAHs in sediment. In addition, we introduced the concept of defining zones of sediment from the latest USEPA sediment management guidance, which was incorporated into the RAF document. The RAF was developed with an adaptive management approach built into the process so that lessons learned and information gained from earlier sites will be used to guide site-specific evaluations

for subsequent sites. This adaptive management approach may involve refinements in habitat evaluations, the collection of site-specific data, the manner in which risks are characterized, and the use of risk-related information in management decisions.

The RAF process has been incorporated into the Stevens Point and Manitowoc Site-Specific Work Plan documents. At both sites, the process will be used to extensively limit the need for further risk assessment in the upland portions of the site as a result of past remedial actions and the results of site-specific habitat evaluations. For example, at the Manitowoc site the habitat evaluation was used to propose no need for evaluation of ecological risks in the upland site area because of the lack of sufficient ecological habitat.

The RAF process includes the following concepts:

- Use of an adaptive management approach so that lessons learned on early sites can be applied to later sites.
- Consideration of background conditions when evaluating site-related risks at each site.
- Upfront site visits (including qualitative habitat evaluations) during the remedial investigation work plan development to focus remedial investigation needs and the site-specific risk assessment approach.
- More detailed habitat assessments of the river during the remedial investigation to focus the ecological risk assessment on appropriate receptors and collect information important for evaluating different remedial solutions.
- Use of a streamlined human health and ecological risk assessment process for the upland media whenever possible, and additional levels of evaluation only as needed.
- Human health exposure evaluations for the river environment are tailored to the specific characteristics of the river at each site. For example, where water is too deep for human contact with sediment, this exposure pathway is eliminated.
- River investigations for the ecological evaluations are tailored to each site and use state of the art sediment characterization techniques coupled with sediment toxicity testing to evaluate potential ecological risks and to define different risk zones.

Support for Development of Risk-Based Methods to Assess Potential Impact of PAHs in Sediments at MGP Sites

Client: Electric Power Research Institute

Location: Various

Exponent staff have conducted a series of projects for EPRI, focused on the development of a risk-based approach for assessing potential impact of PAHs in sediments at MGP sites.

We wrote a chapter titled “Assessing Ecological Risks of PAH-Contaminated Sediments” in the *Sediments Guidance Compendium* published by EPRI. The *Sediments Guidance Compendium* provides a comprehensive review of key issues pertaining to the management, assessment, and cleanup of contaminated sediments at former MGP sites. Our chapter lays out the current thinking regarding the planning, conduct and use of ecological risk assessments for decision making for PAH-contaminated sediments in the United States. Topics covered in the chapter include: developing management goals; tiered assessment programs; conceptual models specific to PAH-contaminated sediments; developing assessment endpoints; multiple lines of evidence methods; developing work plans and sampling plans; PAH-specific issues associated with bioaccumulation and the food web; methods used to describe, characterize, or model risk; and how risk assessment information is, should, or could be used to inform decision-making.

We also conducted a number of research projects that focused on improving our understanding of the bioavailability and toxicity of sediment-associated PAHs to aquatic organisms. One of the goals of this work was to demonstrate that current draft sediment quality guidelines for PAH mixtures are overly conservative predictors of toxicity at MGP sites. In the first project, we compiled available data from various MGP sites on concentrations of PAHs in sediment and associated levels of sediment toxicity in laboratory tests. The data were used to validate an approach that can be used to develop site-specific remediation goals at MGP sites. In subsequent projects, we field-tested approaches that can be used to assess the bioavailability and toxicity of PAHs in sediments. Sediment samples that were collected from four former MGP sites were analyzed for a suite of parent and alkylated PAHs, as well as for “black carbon.” Black carbon, which can include tars, pitch, and soot, is an operationally defined class of sediment organic carbon that has been shown to reduce the bioavailability of PAHs in sediment.

Salem Harbor Area Former MGP Sites

Client: National Grid (Formerly Massachusetts Electric Company)

Location: Salem Harbor, Massachusetts

Project Description: Working for National Grid (formerly Massachusetts Electric Company), Exponent staff developed a comprehensive assessment at a former manufactured gas plant (MGP) site in Salem, Massachusetts. Part of the project involved a multi-media ecological and human health risk characterization at the coastal MGP. Initial studies focused on assessing the impact of an *in situ* bioremediation application. Our scientists designed and employed a biomonitoring survey to assess the health of the benthic communities over a 6-year period

following bioremedial activities. In addition, we designed and completed a site risk characterization. The project also included the development of a complex scope of work covering a variety of human receptors, terrestrial wildlife, and coastal marine wildlife. The assessment was applied to industrial, wetland, scrub-shrub, intertidal, and estuarine habitats.

The human health risk assessment considered current and future site uses as well as potential risks to residents bordering the cove. Exposure pathways included direct contact, incidental ingestion, and vapor intrusion. A spatially-explicit approach was used to define upland zones that contributed to the risk and that could be addressed through targeted remediation. Exponent scientists have developed methods for evaluating risks associated with vapor intrusion at MGP sites and those approaches were successfully applied at this site.

To support the ecological assessment, our staff designed a multi-media field sampling program that was used to delineate zones of risk in the aquatic environment. This is similar to the approach that Exponent presented in the RAF and discussed with Mary Logan of USEPA Region 5. Exponent also developed a means of screening terrestrial habitats to determine whether they should be included or excluded from formal assessment. At this site, they were excluded as they did not meet critical criteria.

This work involved a field program designed and implemented by Exponent staff. This included the collection of sediment for chemical analysis and toxicity testing, assessment of benthic community health, analysis of bioaccumulation, as well as visual analysis of habitat types. The design of studies is based on experience at numerous MGP sites and was tailored to the appropriate measures. A terrestrial habitat survey and screening assessment were also completed. Lines of evidence were integrated in a weight of evidence approach to reach an understanding of potential risks and risk drivers at the site. The human health and ecological assessment results were used to narrow of the focus of remedial alternatives. As with many other MGP sites, Exponent staff successfully demonstrated that bioavailability of PAH compounds to human receptors and ecological receptors was substantially reduced. Exponent staff were able to demonstrate that the area where risks were present was considerably less than the zones where MGP-related contaminants were elevated. Through application of multiple lines of evidence, areas with highly weathered MGP-related chemicals were demonstrated to present a low potential risk to ecological receptors. The project required close integration with a broad project team involving two engineering firms and two clients.

For the same client, Exponent staff conducted another Massachusetts Contingency Plan (MCP) ecological risk assessment in the same area, and again we were able to delineate risk zones. We developed a field program and conducted an ecological risk assessment under the MCP for a portion of the Bass River in Beverly, Massachusetts, potentially affected by a former MGP site. We sampled surface water and sediment for chemical analysis, sediment for toxicity testing (using the amphipod *Ampelisca abdita*), and benthic organisms for benthic community analysis. We applied a weight-of-evidence approach (sediment triad) to evaluate potential ecological risk in the sediment. We worked closely with the site engineer to apply our findings to the remedial strategy.

Former Messer Street MGP Site

Client: Northeast Utilities Service Company

Location: Laconia, New Hampshire

Project Description: A human health and ecological risk assessment was designed and conducted to assess risk from PAHs and other contaminants associated with a former MGP on the Winnepesaukee River in Laconia, New Hampshire. There was potential exposure of human and ecological receptors to PAHs from coal tars discharging to the river at discrete points, from tarry sediments, and from PAH-contaminated sediment and surface water. The risk assessment followed New Hampshire Department of Environmental Services policy in addressing potential risk to humans from exposure to sediment, surface water, and ingestion of fish from the river. The human health risk assessment assessed exposure to swimmers using the river, boaters using a local boat ramp, recreational anglers eating fish from the river, and individuals exposed to sediment along the riverbanks. Ecological exposures included exposure to contaminated sediments, tarry areas, and fish and invertebrates as a food source to higher trophic levels. Fieldwork included:

- Sampling of fish and shellfish for fillet and whole body concentrations of PAHs
- Sediment toxicity testing
- Sediment benthic community analyses
- Evaluation of sediment PAH concentrations.

Information generated from the sampling and analysis was evaluated using a weight of evidence protocol to assess ecological risk, following New Hampshire's guidance on ecological risk assessment. The ecological risk assessment also incorporated New Hampshire's use of readily apparent harm to assess ecological risk.

The risk assessment identified potential human health risks for swimmers exposed to surface water in the Winnepesaukee River and for anglers consuming fish from the river. The risk assessment also identified potential ecological risk to receptors in the Winnepesaukee River. Specifically, in certain locations in the river, there was potential ecological risk to sediment dwelling invertebrates, which are an important food source for local fish species. We worked closely with engineers and geologists from Haley and Aldrich, Inc. to develop a map of zones of readily apparent harm and to incorporate the results of the risk assessment into a remedial action plan. The plan as implemented included risk-based decisions for guiding the extent and type of remedial action. We also provided risk communication materials.

After completion of remedial activities at the site, we developed and implemented a post-remediation performance monitoring plan to assess whether the remedial goals for human health and ecological receptors have been achieved. Post-remediation monitoring for human health included the re-evaluation of human health risks based on two consecutive years of post-remediation fish fillet and surface water data. Fish tissue and surface water data were collected

in 2002, approximately one year after completion of remedial activities, and were used in the first post-remediation risk assessment. The second round of fish tissue and surface water samples was collected the following year, and was used in the second post-remediation risk assessment. Post-remediation monitoring of benthic invertebrates began two years following remedial activities, to allow the benthic community time to be re-established. Based on the 2002 post-remediation data and updated toxicity information, no significant risks were identified for a swimmer exposed to surface water in the Winnepesaukee River or for an angler consuming fish from the Winnepesaukee River. The post-remediation evaluation for the benthic community is on going, and is being conducted every other year.

Tools for Streamlining Ecological Risk Assessments at RCRA Corrective Action Facilities

Client: General Motors

Location: USEPA Region 5

Project Description: General Motors (GM) has approximately 100 sites subject to corrective action under the Resource Conservation and Recovery Act (RCRA) in EPA Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin). These sites include assembly plants, parts plants, plating operations, and foundries. Most facilities tend to be bounded by urban areas, with all or most of the property developed in some capacity (e.g., parking lots, buildings, process areas). However, some facilities also include relatively large undeveloped areas such as woodlands or fields.

As GM's ecological risk consultant, Exponent has been supporting GM in working collaboratively with EPA Region 5 to develop a set of tools that can be used at RCRA corrective action sites to enhance the efficiency of the ERA process. The risk assessment tools are designed to streamline the ecological risk assessment (ERA) process by early identification and refinement of areas of concern and application of a consistent set of receptors, assessment and measurement endpoints, and toxicity reference values (TRVs). The overall objective of the streamlining process is to develop standardized approaches to and tools for ERA that enhance the usefulness of data for risk-based decision-making, while remaining consistent with EPA guidance.

Exponent identified the following key areas where performance of ERA during RCRA facility investigations (RFIs) could be improved:

- Assessment of the habitat characteristics of man-made features in an industrial context
- Consistency in selection of assessment and measurement endpoints and toxicity reference values (TRVs).

Habitat Assessment: The site investigation process under RCRA corrective action proceeds along a path of identifying contamination, investigating its nature and extent, and implementing

corrective actions (if needed) for individual areas of interest (AOIs). At many sites, there are dozens of individual AOIs. Many AOIs are inside buildings, underneath concrete slabs, or are industrial structures, and thus clearly provide no habitat for typical ecological receptors. In other cases, there may be undeveloped areas such as wooded lots, wetlands, or fields that were not identified as AOIs because they were never subjected to any facility-related activity. There are not likely to be complete exposure pathways for ecological receptors in AOIs that provide no habitat—thus it is clearly inefficient to perform a chemical screening in these areas. Similarly, there are not likely to be complete exposure pathways in areas where there have been no releases of hazardous substances, and it would not be appropriate to require sampling and screening in these areas. However, some site features may provide resources for ecological receptors and may present complete exposure pathways as a result of documented releases or facility history.

A habitat assessment matrix was developed to enable risk assessors to 1) eliminate areas from further consideration in an ERA if documentation was sufficient to demonstrate that there were no complete exposure pathways, and 2) focus subsequent steps of the analysis by providing the basis for developing a contextually appropriate conceptual site model. The habitat assessment matrix is designed for use during a habitat characterization.

Endpoint and TRV Selection: Exponent has also improved the efficiency and predictability of the ERA process for GM by developing and employing standard sets of assessment endpoints and TRVs for selected receptors and substances. Standardizing these facets of the risk assessment frees risk assessors and risk managers—especially in cases where a single organization has a large number of sites within any given EPA region—from having to “reinvent the wheel” at each site. For example, a substantial level of effort is typically spent in developing the documentation needed to support the selection of receptors, exposure parameters, and TRVs. *A priori* agreement on the literature base, data interpretation, and rationale for determining these risk assessment variables also results in more efficient review by risk managers by precluding the need for much debate on technical issues. EPA Region 5 agreed on the application of a standard list of receptors that are likely to occur in the urban settings in the general EPA Region 5 ecoregion. Consistent with ERA guidance, these receptors are also expected to be maximally exposed and sensitive to substances that commonly occur at sites. Exposure parameters were developed for these receptors from references commonly used in risk assessments. The list of receptors is not necessarily all-inclusive, and both parties agree to consider other receptors as appropriate on a site-by-site basis. TRVs were developed based on the most current toxicological literature for the most common substances of concern. Whenever possible, source studies are selected that report effects of chronic dietary exposure on survival, growth, or reproduction. Potential source studies are also screened for ecological relevance of study design, test species, and chemical form. The most sensitive relevant endpoint available is selected. TRVs are expressed as a daily dietary dose, and are calculated from dietary exposure endpoints. The list of TRVs is also not necessarily all-inclusive, and both parties agree to consider alternative TRVs as appropriate, in particular if a change is warranted based on new information in the toxicology literature.

Risk-Based Decision Support Tools to Support the Dredged Material Management Program

Client: U.S. Army Corps of Engineers, Waterways Experiment Station

Location: Various

Project Description: Exponent staff have provided technical support for risk-based decision-making for the U.S. Army Corps of Engineers (Corps) Dredged Material Management Program. This includes developing models for evaluating uncertainty and variability, developing spatially explicit foraging models to refine exposure estimates in aquatic and terrestrial food webs, providing guidance on conducting risk assessments for open water and upland disposal of dredged materials, and completing ecological risk assessments for large waterways. We have completed two risk assessments for placement of dredged materials containing measurable concentrations of DDT and metabolites. These projects demonstrate the technical flexibility offered by our scientists in the development of transport and fate analyses to support ecological exposure assessments, development of tools to evaluate the potential effects of bioaccumulation, and completion of large risk assessments involving bioaccumulative substances. Under this project, our scientists have completed reviews of monitoring data, conducted literature searches and reviews, provided evaluation of transport and fate, bioaccumulation, and risk studies, developed reports, and developed and managed databases.

One product of this effort is the development of a tool called TrophicTrace for calculating the potential human health and ecological risks associated with bioaccumulation of contaminants in sediments and dredged materials. The model can be used as a screening tool or can incorporate available site-specific data for more refined estimates of potential risk. It was designed to be used within the Corps' tiered approach to dredged material management. This tool can be used to provide health- and ecologically-protective estimates of potential risk using results from sediment chemistry tests or 28-day bioaccumulation tests. The model, available from the Corps website, currently incorporates several example data sets for various human and ecological receptors. The user can edit the demonstration model parameters as well as create new models based on different fish species and/or site-specific human and ecological exposure parameters. The model incorporates interval analysis to quantify uncertainty based on ranges of input parameters (e.g., minimum, average, upper bound on the average, and maximum).

Another tool we have developed is the Spatially Explicit Exposure Model (SEEM) for terrestrial systems. Tools for exposure analysis currently available to the risk assessment community range from simple statistical calculations applied broadly across an entire site (average, maximum, 95% UCL, percentiles) to complex GIS-based modeling. Models such as SEEM that evaluate population-level risks and include spatial considerations such as habitat quality, but also remain accessible to a range of users, are not readily available. SEEM is an exposure model that balances assessment power with usability/accessibility. This model is being developed for incorporation within the Army Risk Assessment Modeling System (ARAMS) as a spatially explicit, population exposure module. SEEM improves the analysis of population risk by allowing the user to evaluate the exposure to each individual within the defined local population and track each individual as it employs different foraging approaches (e.g., radial/nesting versus random walk). In addition, SEEM increases the realism of the exposure

assessment process by incorporating habitat quality considerations at a resolution finer than the entire site. SEEM may be used as a standalone model, but ultimately it is designed to draw input parameters from the other modules within ARAMS.

FishRand-Migration is a similar modeling tool, but is designed for aquatic systems. Dr. von Stackelberg provided the technical lead on development of this probabilistic bioaccumulation model, which was originally developed in support of the RI/FS for a large Superfund site. This mechanistic, time-varying model is based on a modeling approach developed by Frank Gobas of Simon Fraser University. The model relies on solutions of differential equations to describe the uptake of bioaccumulative contaminants over time, and incorporates both sediment and water sources to predict uptake based on prey consumption and food web dynamics. The model was calibrated to data for the site using Bayesian updating statistical techniques. The model successfully underwent peer review in 2000.

Guidance for Assessing Risk of Mixtures of Organic Contaminants: We prepared a technical review for USEPA and the Corps on approaches used to characterize the toxicity of mixtures of organic contaminants to fish. We also developed a cumulative distribution of toxic tissue concentrations of chlorinated cyclodiene pesticides to fish. We are in the process of developing a novel approach for USEPA and the Corps to assess toxic effects of dietary and water-borne doses of PAHs to fish. For this effort we reviewed literature, summarized data, and are estimating protective dose levels.

Comparative Risk Assessment Framework for the Dredged Materials Management

Program: We developed a comparative risk assessment framework for the Corps that identifies characteristics of various placement and treatment alternatives for dredged materials that contribute to potential environmental risk. The framework was developed for use by environmental managers in identifying important transport and fate mechanisms and routes of potential exposure, and to illustrate the need for a comprehensive site assessment. A peer-reviewed paper on this work was awarded the Integrated Risk Assessment Paper of the Year for 2002 by *Human and Ecological Risk Assessment*: “A Comparative Screening-Level Ecological and Human Risk Assessment for Dredged Material Management Alternatives in New York/New Jersey Harbor,” Hum. Ecol. Risk Assess. 8:603–626.

Summary: We have developed numerous tools to support cost-effective environmental decision-making related to the disposal of dredged materials. These tools are applicable across a wide variety of sites and contexts, and are not exclusive to dredged materials.

- These tools have assisted in the evaluation of a variety of environmental decisions, ranging from placement of dredged materials to a comparison of remedial alternatives and/or management actions at waste sites.
- Modeling tools of this kind provide a mechanism and framework for evaluating site-specific data, and in particular, the potential effects of management actions in terms of future concentrations and risks.

Table 1. Case history information

Project Name	Team Members/Roles	Scope of Services
Multi-site Risk Assessment Framework Document and Work Plan Support for the Wisconsin Public Service Corporation Manufactured Gas Plant Sites	Charles Menzie, Principal Michael Kierski, Project Manager Ted Wickwire, Joe Famely, Ben Amos, Cheri Butler, Technical Support Susan Driscoll Kane, Technical Advisor	Assisted in the developed of a risk assessment framework to be used to conduct baseline risk assessment at six MGP sites in Wisconsin. Have applied the framework to aid in development of two site-specific work plans.
Support for Development of Risk-based Methods to Assess Potential Impacts of PAHs in Sediments at MGP Sites	Charles Menzie, Principal Susan Driscoll Kane, Project Manager Ted Wickwire, Meg McArdle, Joe Famely, Ben Amos, Cheri Butler, Technical support;	Developed models for evaluating uncertainty and variability, developing spatially explicit foraging models to refine exposure estimates in aquatic and terrestrial food webs, providing guidance on conducting risk assessments for open water and upland disposal of dredged materials, and completing ecological risk assessments for large waterways.
Salem Harbor Area Former MGP Sites	Ted Wickwire, Project Manager Charles Menzie, Principal, Technical Advisor Margaret McArdle, Technical Advisor Joseph Famely, Project Scientist	Multi-media ecological and human health risk characterization, including assessment of the health of benthic communities following bioremedial activities. Project included sediment sampling and habitat survey and screening assessment. Second site involved surface water sampling and a sediment triad analysis to evaluate potential ecological risk in the sediment.
Messer Street MGP	Charles Menzie, Principal Ted Wickwire, Meg McArdle, Technical Support	A human health and ecological risk assessment was designed and conducted to assess risk from PAHs and other contaminants associated with a former MGP on the Winnepesaukee River in Laconia, New Hampshire. Site-specific exposure data were collected including fish and shellfish PAH tissue concentrations. Sediment toxicity testing was also performed. Assisted with developing sediment remediation goals and performed post remediation monitoring.
Tools for Streamlining Ecological Risk Assessments at RCRA Corrective Action Facilities	Linda Ziccardi, Project Manager for implementation	Developed risk assessment tools to streamline ERA process by early identification and refinement of areas of concern and application of a consistent set of receptors, assessment and measurement endpoints, and toxicity values. Overall objective of the process was to develop standardized approaches to and tools for ERA that enhance the usefulness of data for risk-based decision-making, while remaining consistent with EPA guidance.
Risk Based Decision Tools to Support Environmental Decision-making under the Dredged Material Management Program	Charles Menzie, Principal in Charge Susan Kane Driscoll, Project Manager Ben Amos, Joe Famely, Ted Wickwire, Technical Support	Developed tools to evaluate the potential for human health and ecological impacts associated with bioaccumulation of sediment-based contaminants

Table 2. Former manufactured gas plant sites—representative experience of Exponent personnel

Location	Client	Type of Work
Arizona		
Phoenix	Arizona Public Service	Conducted human health risk assessment for residents of apartment building located on former MGP site.
California		
Los Angeles	Confidential	Provided technical support and senior technical review for RI/FS.
Oakland	Confidential	Provided technical support and senior technical review for RI/FS.
Colorado		
Fort Collins	Confidential	Human health risk assessment.
Connecticut		
Stamford	Northeast Utilities	Provided guidance on how to conduct this and other risk assessments; identified sampling needs.
Delaware		
Wilmington	Delmarva Power	Developed exposure scenarios, estimated exposure, and modeled chemical fate and transport; output of work was used by DFI for SITES model application.
Florida		
St. Augustine	Unified Gas Improvement	Cost allocation litigation support.
St. Augustine	GEI Consultants, Inc.	Developed risk-based soil cleanup levels for redevelopment of former MGP site.
Tallahassee	Confidential	Conducted ecological risk assessment at urban park on former MGP site.
Georgia		
Athens	Georgia Power Company, Atlanta Gas Light Company	Conducted ecological risk assessment; FETAX toxicity testing.
Illinois		
Alton	Union Electric	Responsible for human health risk assessment including quantitative uncertainty analysis.
Chicago Area	Confidential	Provided technical support during remediation of former MGP site in residential area including risk analysis of benzene vapors, statistical analysis of monitoring data, and engineering consulting.
Chicago Area	Confidential	Performed a biological survey of the river adjacent to a former MGP site to evaluate whether the former facility was having an effect on the biological integrity of the river. Also provided strategy support on next phases of the site evaluation.
Waukegan Harbor	Mercury Marine	Conducted risk assessment in concert with engineering plans for new marina at former MGP site.

Location	Client	Type of Work
Iowa		
Cedar Rapids	MWH Americas, Inc.	Performed a screening level ecological risk assessment and qualitative benthic macroinvertebrate survey for MWH at this MGP site, which helped gain closure of the site.
Des Moines	MWH Americas, Inc.	Performed a screening level ecological risk assessment for MWH at this MGP site, which helped gain closure of the site.
Kentucky		
Louisville	Louisville Gas & Electric	Responsible for human health and ecological risk assessments, worked with the State on applications of guidance, and developing remedial target levels
Maryland		
Baltimore	Confidential	Provided technical support and senior technical review for RI/FS, risk assessment, strategy development, remedial alternative analysis, remedial research, and closure plan development for inner harbor industrial park redevelopment.
Baltimore	Baltimore Gas and Electric	Provided technical support and senior technical review for remedial research, and closure plan development.
Massachusetts		
Attleboro	Eastern Gas	Provided expert witness testimony related to human health effects associated with exposure to complexed cyanides.
Beverly	Massachusetts Electric Company	Developed field program and conducted ecological risk assessment.
Boston Area	Insurers	Used environmental forensics methods to determine how contamination occurred at three former manufactured gas plants located in Lynn, Malden, and Salem, in the Boston area.
Boston Harbor	Honeywell	Evaluated timing of release and location of sediment contamination resulting from multiple sources including a former MGP plant.
Everett	Boston Gas	Responsible for Massachusetts Contingency Plan ecological risk assessment and aquatic studies within Mystic River.
Holyoke	Northeast Utilities	Responsible for Massachusetts Contingency Plan ecological risk assessments; developed and implemented aquatic sampling programs along the Connecticut River.
Nantucket	Nantucket Electric	Developed risk assessment scope of work; negotiated with Massachusetts DEP on conduct of Massachusetts Contingency Plan Phase II risk assessment.
Perkins Park	Massachusetts Electric Company	Conducted an ecological risk assessment under the Massachusetts Contingency Plan for a former MGP site.
Salem	National Grid/ Massachusetts Electric/ KeySpan Energy Delivery	Completed multi-media ecological and human health risk characterization at a coastal MGP site.
Salem	Boston Gas, New England Power	Responsible for Massachusetts Contingency Plan ecological risk assessments.

Location	Client	Type of Work
Michigan		
23 sites	London Market Insurers	Technical and litigation support related to the chemical stability of the materials of construction of storage vessels at MGP sites located in East Flint, Lansing, Kalamazoo, Jackson, Zilwaukee and elsewhere.
Missouri		
Columbia	Union Electric	Responsible for human health risk assessment and interacted with State to determine suitable modeling approach.
Nationwide		
	Electrical Power Research Institute	Provided research planning for site assessments and remedial actions at MGP sites.
	Electrical Power Research Institute	Evaluated the power of sediment quality guidelines to predict sediment toxicity. Analysis involved review of test data from MGP sites.
	Gas Research Institute	Developed a comprehensive multimedia exposure model handbook to assist utilities in remediating former MGPs.
	Gas Research Institute	Prepared Volume III of the four-volume GRI guidance document, Management of Manufactured Gas Plant Sites.
New Hampshire		
Danvers	Massachusetts Electric Company	Conducted human health risk assessment at former MGP site.
Laconia	Haley & Aldrich	Designed and conducted a human health and ecological risk assessment to assess risk from PAHs and other contaminants associated with a former MGP on the Winnepesaukee River.
Laconia	Northeast Utilities and Energy North	Conducted risk assessments and developed risk-based site-specific remediation goals.
Lynn	Massachusetts Electric Company	Designed and conducted ecological risk assessment under Massachusetts Contingency Plan guidance.
Marblehead	Massachusetts Electric Company	Conducted a human health and ecological risk assessment at a former MGP site.
North Adams	Massachusetts Electric Company	Designed and conducted risk assessments used in remedial design development and calculation of cleanup criteria.
New Mexico		
Albuquerque	Public Service of New Mexico for CDM Engineers	Developed risk-based soil cleanup levels accounting for direct soil exposure and vapor intrusion for redevelopment of a former MGP site. This site has been remediated.
New York		
Bronx	Insurers	Determined how contamination occurred at the Hunt's Point coal gas and water gas plant. .
Long Island	Insurers	Used environmental forensics methods to determine how contamination occurred at each of seven Long Island former MGPs: Bayshore, Glen Cove, Halesite, Hempstead, Patchogue, Rockaway Park, and Sag Harbor.
Manhattan	Insurers	Determined how contamination occurred at the West 18 th Street, a coal gas plant dating to 1834.

Location	Client	Type of Work
Pelham	Insurers	Determined how contamination occurred at the Pelham Parkway MGP using Sanborn maps, utility commission reports, aerial photographs, and other resources.
Queens	Insurers	Determined how contamination occurred at the Astoria MGP, at one time the largest plant in the world.
Saratoga Springs	Niagara Mohawk Corporation	Reviewed and commented on all documents prepared by EPA and its consultants on risks at this Superfund site.
Western New York State	New York State Electric & Gas	Responsible for human health and ecological risk assessments for several MGP sites located on lakes and rivers.
Utica	Niagara Mohawk Corporation	Responsible for human health and ecological risk assessments, developed clean-up levels, risk communication, and testing in support of remedial strategies.
North Carolina		
Charlotte	Duke Power	Provided training and support to Duke Power personnel in conducting risk assessment and air sampling at the site.
Fayetteville	Carolina Power & Light, City of Fayetteville	Conducted human health and ecological risk assessment at former MGP site. Developed risk-based site-specific remediation goals.
Raleigh	North Carolina Power and Light	Provided possible litigation support related to risks associated with the site.
Oregon		
Eugene	Eugene Water and Electric Board	Conducted RI/FS and risk assessment; provided technical support for strategy development and cost allocation.
Virginia		
Shenandoah River	Confidential	Developed Hazard Ranking System score for former MGP site.
Tributary to James River	Confidential	Conducted health and ecological risk assessments at former MGP site.
Washington		
Renton	Quendall Terminals (Limited Partnership)	Developed investigation, interim removal, and disposal plans for asbestos contaminated with PAH. Provided technical support in regulatory negotiations. Instrumental in convincing EPA to not list this site.
Renton	City of Renton	Regulatory analysis, technical support, economic analysis, remedial failure analysis, and redevelopment support to client for site development plan.
Seattle	Puget Sound Energy	Evaluated sources of PAH at Union Station site (former MGP, railroad terminal and iron foundry). Provided expert reports and depositions.
Seattle	Seattle Parks Department	Gasworks Park RI/FS review and technical assistance to regulatory agency site manager.
Tacoma	Puget Power, Seattle City Light	Hazard assessment; health risk evaluation for a <i>de minimis</i> settlement.

Location	Client	Type of Work
Wisconsin		
Ripon	MWH Americas, Inc.	Responded to WDNR comments on past sediment investigations and developing a risk-based approach for moving forward with the project.
Sheboygan	Natural Resource Technology, Inc. (NRT)	Assisted NRT in preparing a quality assurance project plan and sampling analysis plan for the Campmarina MGP site.
Multiple	NRT	Assisted NRT in development of the Multi-site Risk Assessment Framework document for six former MGP sites under the Superfund Alternatives Site (A) Program on behalf of Wisconsin Public Service Corporation.

Other Resources

Exponent has highly qualified resources that we could bring to bear on projects to assist Integrys and their remedial investigation/feasibility study (RI/FS) consultants with needs on specific MGP projects. Our services would complement those of the RI/FS consultants, and include specialized human health risk communication support (Anderson), forensic interpretation at sites (Boehm and Saba), natural resource damage assessment claim support (Booth), assessment of bioavailability of specific chemicals (Lowney), groundwater to surface water transport of contaminants (Mohsen), and vapor intrusion modeling (Turnham). The people highlighted include leaders in their respective fields who would be available for advice on these topics as the need arises. A short biographical sketch of each of these individuals is provided.

Dr. Elizabeth L. Anderson is the Group Vice President of Exponent Health. Prior to joining Exponent, Dr. Anderson was President and CEO of Sciences International, a health and environmental consulting firm. She specializes in risk assessment as a basis for addressing the complex problems that arise in the context of regulatory and legal matters related to health and the environment for national and international companies and governments.

Dr. Anderson has more than 25 years of experience in working both within government institutions and for corporate entities. Previously, for the U.S. Environmental Protection Agency (EPA), she founded and directed the Agency's Carcinogen Assessment Group and the central risk assessment programs for 10 years. In this capacity, she was Executive Director of the EPA committee that initially adopted risk assessment as a basis for carrying out the Agency's regulatory mandates. She has also worked extensively on international risk assessment issues to address human health and ecological consequences of exposure to environmental toxicants, including for private companies, governments, the World Health Organization, and the Pan American Health Organization.

Dr. Paul D. Boehm is Group Vice President and Principal Scientist, with overall responsibility for Exponent's Environmental business. He has devoted his 30 years of consulting experience to advising industrial, legal, and government clients on scientific aspects of the investigation of contaminated sediments and terrestrial sites, oil spills, oil and gas geochemistry, environmental monitoring, exposure and bioavailability assessment, and the use of environmental forensic methods to apportion liabilities. His main scientific focus has been on the environmental chemical aspects of aquatic and terrestrial contamination, inclusive of persistent organic pollutants, petroleum, PAHs, and petrochemicals.

Dr. Boehm has specifically practiced in the areas of environmental forensics: allocation and dose reconstruction, petroleum chemistry, and natural resource damage assessment (NRDA) for oil spills, Superfund sites, medical exposures, and transactional matters. His extensive knowledge of the strategic application and practice of environmental forensics (chemical fingerprinting, transport and fate, source attribution, and allocation) relates to PAHs, petroleum hydrocarbons, PCBs, dioxins, and other compounds. His expertise also includes

the transport and fate of chemicals in surface water and groundwater, contaminated sediments assessments, environmental impact assessments for new international capital projects, and environmental studies for LNG projects.

Mr. Pieter Booth is a Principal in Exponent's EcoSciences practice. He has 28 years of experience as an environmental scientist and program manager specializing in ecological risk assessment and natural resource damage assessment (NRDA). Mr. Booth is currently managing a program for General Motors Corporation, to provide site-specific ecological risk assessments and to develop corporate ecological risk assessment guidance for General Motors' program managers. For other industrial clients, Mr. Booth assists in developing overall strategies for environmental issues, designing site-specific assessments, and negotiating with state and federal agencies. In addition, he has supervised the collection and analysis of environmental data and the development of PC-based data management and negotiation tools. Mr. Booth has led numerous projects directed at the characterization and remediation of contaminated sediments and he has helped to create guidance and policy for sediment management programs in Puget Sound and San Francisco Bay.

Mr. Booth is nationally recognized for his NRDA work, particularly his management of the recently settled Saginaw River and Bay and Lake Hartwell/Twelvemile Creek NRDA's. He has been project manager or consulting expert on NRDA's for industrial clients in several other high-profile natural resource damage cases. In these roles, he has provided technical support to legal teams in the development of case strategy and in the supervision and preparation of materials for litigation support under CERCLA, RCRA, the Clean Water Act, and the regulatory programs of various states.

Ms. Yvette Wieder Lowney is a Managing Scientist with 20 years of professional and technical project management experience. She specializes in human health risk assessment, with special focus on evaluating health effects associated with exposure to metals, particularly under non-standard exposure scenarios (e.g., childhood, or intermittent adult exposures), and to organic contaminants from industrial sites. While focusing on performing site-specific, multipathway risk assessments, Ms. Lowney has gained experience in data aggregation, preparing technical position papers that describe appropriate risk assessment methods, critically reviewing risk assessment guidance and regulatory policies, and developing cleanup standards for use in voluntary or mandated cleanup of sites and in Brownfields redevelopment. In addition, she has supported clients in negotiations with regulatory agencies and public presentations.

In the context of conducting risk assessments for metal-containing soils, Ms. Lowney has been closely involved in developing data regarding the bioavailability of metals from soils. She is managing multi-year research projects focused on developing robust databases for relative bioavailability to human and ecological receptors, with the eventual goal of generating validated bench-top extraction models for assessing the relative bioavailability of metals from soil, for application in both human health and ecological risk assessments.

Dr. Farrukh Mohsen is a Managing Engineer in Exponent's Environmental Sciences practice and is based in Albany, New York. He has 28 years of experience in hydrogeology and groundwater flow and contaminant transport modeling. He has applied his technical

strengths in assisting corporate clients nationwide in providing expert opinions in litigation, environmental compliance, and liability allocations. Dr. Mohsen focuses primarily on developing an understanding of transport and fate of constituents in the subsurface both in groundwater and in soil vapor. He has helped his clients in determining the source of groundwater contamination, designing and evaluating remedial options, conducting risk assessments, assisting in regulatory negotiations, achieving environmental compliance, delivering public presentations, providing expert opinions, and refuting claims by other experts.

Dr. Tarek Saba is a Senior Scientist in Exponent's Environmental Sciences practice. He has 7 years of consulting experience in groundwater hydrology, numerical simulation of contaminant transport and fate, design/optimization of various groundwater remediation scenarios, and advanced chemical forensics. Dr. Saba has used these skills to optimize pump and treat systems for chlorinated solvents in a New Hampshire Superfund site, develop a Department of Defense decision support system to evaluate cost-effectiveness of source zone treatment, and evaluate publicly available groundwater flow models for the EPA. Dr. Saba has developed several 2-D and 3-D models to simulate nonaqueous phase liquids (NAPL) dissolution in the subsurface and to design hydraulic controls and source area treatments. Dr. Saba has combined his numerical analysis skills with chemical fingerprinting methods to identify sources of chlorinated solvents, NAPL, tar, PCBs, and petroleum hydrocarbons at contaminated sites. At the Paoli rail yard Superfund site, he identified PCB sources and approximate spill timing, resulting in a \$38 million remedial cost recovery settlement in favor of his client.

Mr. Paul Turnham is a Managing Scientist in Exponent's Health Sciences practice. He is a civil engineer and a licensed professional engineer. He has more than 15 years experience working in the fields of quantitative human health risk assessment, site characterization and remediation, and environmental transport and fate. He specializes in the development and application of site- and case-specific approaches to risk and exposure assessment. He has performed and provided day-to-day management of risk and exposure assessments for private clients and in support of litigation. Projects he has managed include residential sites, CERCLA (Superfund) sites both for risk assessment-related services and in support of PRP groups for share allocation issues, a RCRA clean closure site, sites subject to state oversight, and combustion sources such as a hazardous waste-burning cement kiln, a coal-fired power plant, and coke oven batteries.

Mr. Turnham has evaluated health risks arising from actual and hypothetical exposures to environmental media and indoor air impacted by chlorinated solvents, petroleum compounds, metals (in particular arsenic and chromium), polychlorinated biphenyls and dioxins, and asbestos and man-made vitreous fibers. He has assessed the potential risks from the vapor intrusion exposure pathway at residential, commercial and industrial properties. This work included development of a risk assessment and sampling and analysis work plan for potential residential exposures at Superfund site. Mr. Turnham has also led site investigations and remedial actions at sites subject to state regulations and voluntary cleanup programs.

Attachment 1

Project Team Resumes

Charles A. Menzie, Ph.D.
Principal Scientist

Years of Experience: 35 years

Credentials and Professional Honors

Ph.D., Biology, City University of New York, 1978
M.A., Biology, City College of New York, 1974
B.S., Biology, Manhattan College, 1971

Professional Profile

Dr. Charles A. Menzie is a Principal Scientist and Director of Exponent's EcoSciences practice. His primary area of expertise is the environmental fate and effects of physical, biological, and chemical stressors on terrestrial and aquatic systems. Over the past two decades most of this work has been focused on chemicals. Dr. Menzie has worked at more than 120 sites and has been involved in approximately a dozen NRDA-related cases. His experience includes leading human health and ecological risk evaluations at approximately thirty NPL, SAS, and RCRA sites. These include many sites with sediment contamination issues, several of which are recognized as the most challenging sites in the country. Some of these sites have incorporated re-use and restoration components and have won regional and national awards, and recognition and economic benefits for the owners.

Dr. Menzie is recognized as one of the leaders in the field of risk assessment and was awarded the Risk Practitioner Award by the Society for Risk Analysis. He has served on the Council of SRA and the Board of SETAC, the two major professional organizations in this field.

Dr. Menzie has been involved in the development of sediment guidance working directly with the regulatory agencies and through the industry-sponsored Sediment Management Workgroup (SMWG). He has taken the lead on the development of guidance documents for industry and government, focusing on methods that are workable and acceptable to a broad range of parties. He helped to draft the ASTM Standard for Risk-Based Corrective Action (RBCA) for chemical release sites and extended that standard to ecological considerations. In addition, Dr. Menzie has developed and applied methods for identifying third parties who have contributed to contamination in aquatic and terrestrial environments. His expertise in chemical transport and fate includes organochlorine compounds (e.g., PCBs, dioxins, many pesticides), polycyclic aromatic hydrocarbons (PAHs), benzene and other light aromatic hydrocarbons, chlorinated volatile compounds (e.g., TCE and PCE), phthalate esters, petroleum hydrocarbons, metals (e.g., arsenic, cadmium, lead, vanadium, nickel, and zinc), and cyanide compounds.

Relevant Experience: Manufactured Gas Plants (MGP)

Dr. Menzie began working on MGP-related risk issues in the mid-1980s, when he conducted assessments at the first MGP site to be placed on the NPL list. He was also one of the first to defend utilities against NRDA claims at MGP sites. Over the last twenty years, Dr. Menzie has

evaluated both human health and ecological risks associated with more than 40 MGP sites. This includes assessments of a number of MGP sites in USEPA Region 5 (Illinois, Indiana, and Wisconsin). He is the primary author of the Gas Research Institute (GRI) Guidance on human health and ecological risk assessment for MGP sites. He currently is a Principal Investigator for EPRI-funded research on the toxicity of soils and sediments at MGP sites and is currently working on an EPRI guidance document on how to apply Monitored Natural Recovery (MNR) methods for contaminated sediments at MGP sites. Dr. Menzie was also Principal Investigator for the Environmentally Acceptable Endpoints (EAE) Program that focused on the bioavailability of PAHs in surface soils. This program was subsequently extended to evaluations of PAHs in sediments. Dr. Menzie is a co-author of the USWAG-sponsored white paper on naphthalene toxicity and implications for risk assessment and risk management, with an emphasis on MGP sites. Dr. Menzie also has experience with vapor intrusion issues at MGP sites and was the first scientist and risk assessor to address these issues at such sites.

Dr. Menzie has published several papers related to the assessment of risks at MGP sites and is author of the critical review on sources of exposure to carcinogenic PAHs. This paper was prepared to help provide the utility industry and regulatory agencies with a perspective on PAHs in soils at MGP and other sites. Dr. Menzie has also published on exposures to cyanides including the complex cyanides that can be present at some MGP sites. He has given expert testimony on behalf of individual utilities on exposures and risks associated with MGP-related waste residuals.

Dr. Menzie has guided evaluations of background for PAHs and metals in a wide variety of cases. These evaluations have involved surface soils in urban and rural environments and sediments in various water bodies.

Experience in USEPA Region 5

Dr. Menzie is familiar with the environmental issues at many of the MGP sites that will be considered as part of this program as well as how they are viewed by regulatory agencies. He has worked with regulatory agencies in Illinois and Wisconsin (and other Region 5 states) and with USEPA Region 5 since the 1980s. He has been invited to give courses and participate in industry and government-sponsored workshops in the Region. He has served as a peer review expert for some of the larger risk assessments conducted in Region 5. As noted above, Dr. Menzie has worked on a number of MGP sites in Illinois, Wisconsin, and Indiana and is familiar with the expectations of both the state and federal regulators. Because of his work on risk issues, Dr. Menzie has been very successful at developing strategic approaches that have benefited clients from a monetary standpoint and have led to environmentally sound solutions. Feedback from some Region 5 clients indicates that Dr. Menzie's contributions to projects have saved tens of millions of dollars in remedial costs and resulted in outcomes that had high net benefits for the environment. The latter is especially important for utilities that are working closely with surrounding communities.

Michael W. Kierski, Ph.D.
Managing Scientist

Years of Experience: 20 years

Credentials and Professional Honors

Ph.D., Environmental and Occupational Health, University of Minnesota, 1992
B.A., Environmental Biology, St. Mary's College of Minnesota, 1984

Professional Profile

Dr. Kierski provides senior-level expertise in human and ecological risk assessment. Over the past 20 years, Dr. Kierski has evaluated risks associated with chemicals in air, biota, surface water and sediment, soil, and groundwater. He has specialized expertise in the fate and effects of metals such as lead and cadmium, hydrocarbons such as benzene and polycyclic aromatic hydrocarbons (PAHs), synthetic organic chemicals such as PCBs, pesticides, and chlorinated solvents, and explosives. His research emphasis during his academic career was related to metals bioavailability.

Much of Dr. Kierski's work is directed toward the evaluation, remediation, and redevelopment of contaminated properties sites. This requires not only technical expertise but also an ability to work with regulatory agencies at the state level (e.g., in Indiana, Wisconsin, Iowa, Illinois, Michigan, New York, North Carolina, New Jersey) and at the federal level (USEPA, U.S. Fish and Wildlife Service, and the Department of Defense). Dr. Kierski's primary clients include electric and gas utilities, chemical companies, the Department of Defense, law firms, and other environmental and engineering companies. Dr. Kierski is often called upon to represent these clients in public and regulatory forums.

Dr. Kierski has worked on numerous USEPA-led NPL and RCRA sites, where he either performed or managed the baseline risk assessment component of the remedial investigation, and prepared the risk-related components of the feasibility studies. Most of his federal work has been located within USEPA Region 5, and concentrated most heavily within Wisconsin, Illinois, Michigan, and Ohio. He has a good working relationship with both human health and ecological risk assessors within Region 5, the States of Wisconsin, Illinois, Michigan, and Ohio, and has worked within the regulatory framework of each of these states.

As part of MGP projects, Dr. Kierski has managed and assisted in the development of site-specific sediment and surface water evaluations, conducting biological assessment of the river environments adjacent to the MGP sites, provided strategy support on MGP site investigations including the regulatory framework that would be considered most appropriate, and has performed numerous human health and ecological risk assessments.

Dr. Kierski has worked on a number of MGP sites over his career, primarily in Iowa, Wisconsin, and Illinois. He has worked with Natural Resources Technology (NRT) to develop the Multi-Site Risk Assessment Framework (RAF) Document for the MGP sites under the USEPA Superfund Alternatives Site (SAS) Program on behalf of Wisconsin Public Service Corporation. He has also provided technical support on the development of three of the seven site-specific RI/FS work plans under development thus far for MGP sites in Wisconsin.

Dr. Kierski developed a similar, more streamlined guidance document for MGP sites located in Iowa, to help adopt a consistent approach for performing surface water and sediment investigations and evaluations at MGP sites on behalf of MidAmerican Energy. This document was used by the Iowa Department of Natural Resources (IDNR) as a guidance document on MidAmerican's MGP site evaluations. The process within this guidance was used to cost-effectively evaluate and obtain closure at two specific sites that required further sediment evaluation and risk characterization. As part of these projects, Dr. Kierski interfaced with IDNR staff on behalf of MidAmerican Energy to develop the guidance document and negotiate the level of risk evaluation that would be required at each site.

In Wisconsin, Dr. Kierski has worked on numerous sites including NPL sites, and is currently working on a number of projects where he interfaces with Wisconsin Department of Natural Resources staff. His current projects include MGP sites, and a high profile ecological risk assessment that he is managing at the Badger Army Ammunition Plant, which includes site-specific bioaccumulation studies and bird evaluations. In addition, Dr. Kierski has worked closely with the Wisconsin State Health Department both at Badger and at a recent redevelopment site within the State.

Within the State of Illinois, Dr. Kierski has worked on many NPL sites and RCRA sites where he has been the lead or managing risk assessor. He has worked closely with Dr. Thomas Hornshaw, IEPA's lead environmental toxicologist and risk assessor, on many of these projects. His current projects in Illinois include strategy support on MGP sites and the performance of biological assessments associated with MGP sites.

While not within USEPA Region 5, Dr. Kierski worked on a group of 15 MGP sites within the State of Iowa on behalf of MidAmerican, and provided both human health and ecological risk assessment support. He also works on two USEPA-led MGP sites within the State of Iowa.

Dr. Kierski has managed a number of high profile risk assessments where a robust human health or ecological risk assessments were needed, which required a great deal of regulatory and public interface. At the Savanna Army Depot Activity located in northwestern Illinois, Dr. Kierski managed a \$2 million baseline ecological risk assessment for the Old Burning Ground. This evaluation required a multiphase site investigation and ecological risk assessment, and involved a number of working meetings with USEPA, IEPA, USFWS, IDNR, and DOD staff. Dr. Kierski chaired the working meetings and directed the performance and development of the BERA. This BERA won an award from the U.S. Army Corps of Engineers in 2004, and was estimated to have saved the DOD \$20–40 million in remediation costs.

Margaret E. McArdle
Senior Scientist

Years of Experience: 9 years

Credentials and Professional Honors:

M.S., Marine Environmental Science, Marine Science Research Center, Stony Brook University, New York, 1999
B.S., Zoology (*high distinction*), University of Rhode Island, 1996
Phi Beta Kappa Academic Society

Professional Profile

Margaret E. McArdle is a Senior Scientist in Exponent's EcoSciences practice. She has 9 years of experience in evaluating the exposure and effects of contaminants in aquatic and terrestrial systems to ecological receptors. She conducts ecological risk assessments in compliance with state and/or federal program regulatory requirements (e.g., RCRA and USEPA). Ms. McArdle develops quality assurance project plans, field sampling plans, and work plans, as well as reviews and validates data for use in ecological risk assessments. She develops conceptual models, toxicity reference values for aquatic life and wildlife, and wildlife exposure models for ecological risk assessments. Ms. McArdle also applies statistical approaches to evaluate toxicity test data and field assessment data; she also applies weight-of-evidence approaches to ecological risk assessments. She manages staff for field sampling programs and ecological risk assessments. Ms. McArdle also provides technical support and manages tasks associated with litigation-related activities. Her other areas of expertise include endocrine disruption in aquatic life and the bioavailability of contaminants present in sediments and surface water.

Ms. McArdle has experience using the sediment triad approach to assess the bioavailability and toxicity of polycyclic aromatic hydrocarbon (PAH) mixtures in sediments at manufactured gas sites (MGP) sites. She also participated in research for the Electric Power Research Institute and its utility members, which examined the influence of various forms of "black carbon," including coal tars and coke, on reducing bioavailability and toxicity of PAHs in sediment to aquatic organisms.

Examples of Relevant Project Experience

Assessed the body burdens of PAHs in aquatic biota tissues collected from a large river next to a former MGP site in southern Vermont. Designed and conducted the field sampling and analysis plan. Compared measured concentrations of PAHs in aquatic biota tissue to human health and ecological risk based concentrations in a preliminary risk evaluation.

Contributed to research for the Electric Power Research Institute and its utility members that examined the influence of various forms of "black carbon," including coal tars and coke, on

reducing bioavailability and toxicity of PAHs in sediment to aquatic organisms. Conducted sediment assessments, including the interpretation of sediment chemistry and toxicity tests data, for MGP sites.

Contributed to a book chapter for the Electric Power Research Institute on assessing ecological risks of PAH-contaminated sediments.

Contributed to developing a methodology for deriving a dietary dose of total PAHs that is protective of fish. This work was done for USEPA and the U.S. Army Corps of Engineers.

Conducted an ecological risk assessment for a RCRA site in Taunton, Massachusetts. Collected representative samples of surface water, sediment, and biota (e.g., blue crabs, yellow perch, and fiddler crabs) for chemical analysis. Evaluated chemical data, sediment toxicity data and benthic invertebrate community data to evaluate ecological risk from exposure to PCBs, mercury, and dichlorobenzenes in surficial sediments.

Managed a human health and ecological risk assessment for a property along the Mystic River in Boston, Massachusetts. The assessment evaluated exposures to arsenic, lead, PAHs, extractable petroleum hydrocarbons (EPH) and PCBs in groundwater, soil, sediment and biota. Considered future uses of property in human health risk assessment.

Managed a human health and ecological risk assessment for a former incinerator facility in northeast Massachusetts. Dioxins, furans, PAHs and certain metals were found in soils and sediments above background levels. Potential risks from these chemicals to a recreational fisher, trespasser, utility worker, construction worker, and parking lot landscaper were evaluated. The environmental characterization, which was conducted for a nearby pond, evaluated risk to aquatic organisms and semi-aquatic wildlife based on body burdens of contaminants in fish and benthic invertebrates, and on estimated exposure to contaminated sediment and prey.

Conducted an ecological risk assessment for a site containing wetlands in northeast Massachusetts. Evaluated potential risk from metals and PAHs in sediment and wetland soil to the environment based on a comparison to *location conditions* or background levels and evaluations for aquatic life and wildlife based on site-specific information (e.g., toxicity test bioassays, bioaccumulation tests, and food chain modeling). Developed cleanup numbers in sediment and soil that would be protective of ecological receptors at the site.

Conducted an ecological risk assessment and provided technical support to the feasibility study of a former U.S. Army base in California, which included four upland areas of concern and one containing marine sediments. Characterized risk to aquatic organisms, fish, and wildlife through a combination of empirical investigation and modeling. Contaminants of concern included PAHs, PCBs, DDT, dieldrin, and lead.

W. Theodore Wickwire
Senior Scientist

Years of Experience: 12 years

Credentials and Professional Honors:

M.F.S., Forest Science, Yale University School of Forestry and Environmental Studies, 1996
A.B., Biology and Environmental Sciences (*summa cum laude*), Bowdoin College, 1992
Phi Beta Kappa; James Bowdoin Scholar

Co-Author of the HERA Integrated Risk Assessment Paper of Year, 2002.

Kane Driscoll, S.B., W.T. Wickwire, J.J. Cura, D.J. Vorhees, C.L. Butler, D.W. Moore, and T.S. Bridges. 2002. A comparative screening-level ecological and human health risk assessment for dredged material management alternatives in New York/New Jersey Harbor. *Hum. Ecol. Risk Asses.* 8(3):603–626.

Professional Profile

Mr. W. Theodore Wickwire is a Senior Scientist in Exponent's EcoSciences practice. He has 12 years of experience in evaluating the exposure and effects of contaminants in aquatic and terrestrial ecosystems. He is an ecologist focusing on aquatic and terrestrial ecological risk assessment. He conducts and manages ecological risk assessments including development of quality assurance project plans, design and implementation of multi-media field sampling programs, development of conceptual models, application of wildlife exposure models, implementation of weight-of-evidence risk assessment approaches, preparation of final risk characterization reports, development of preliminary remediation goals, and risk communication. Mr. Wickwire incorporates ecological principles in wildlife exposure models and oversees the development of modeling packages to improve the realism of exposure modeling incorporating wildlife behaviors relative to habitat suitability.

In addition, he identifies opportunities to enhance ecological risk assessment by incorporating population assessment, spatial exposure assessment, and habitat quality analyses into the exposure and effects assessments. He also designs and implements long-term biomonitoring programs, such as a program to assess changes in site conditions after *in situ* treatment applications.

Examples of Relevant Project Experience

Managed a pair former MGP sites in Salem Harbor, MA (Collins Cove and Beverly MGP Sites). For National Grid (formerly Massachusetts Electric Company), developed a comprehensive assessment at a former manufactured gas plant in Salem, Massachusetts. The project began with the design and implementation of a multi-year sediment monitoring program to evaluate changes in the benthic community following *in situ* treatment application – nutrient

injection. Additional assessment was completed under the Massachusetts Contingency Plan (MCP) and included development of a scope of work, design and completion of a multi-media field program (terrestrial, wetland, aquatic), research for toxicological benchmarks and toxicity reference values, employment of terrestrial and aquatic bioaccumulation models, completion of food chain models, interpretation of benthic community studies and completion of the ecological risk assessment report. Applied a weight-of-evidence approach to integrate multiple lines of evidence. Project included both terrestrial and aquatic components. After completion of the risk assessment, worked closely with the client to evaluate remedial alternatives with a specific focus on bioavailability of remnant historic coal tars and weathered PAHs.

At a second MGP Site for the same client and in the same area, managed and completed the ecological risk assessment at the former manufactured gas plant in Beverly, Massachusetts. Work included design of a field program to collect sediment, surface water, and biota for analysis. Developed the scope of work and led the field team. In addition, managed the analysis and integration of data and biological studies using a weight-of-evidence approach, and the completion of the ecological risk assessment report. Worked closely with the site engineer to apply findings to the remedial strategy.

Served as project manager on an aquatic risk assessment focusing on a site within the Mississippi River in the St. Louis, Missouri, area. This included developing a screening assessment to evaluate site conditions and designing a comprehensive field program to determine the extent of analysis and evaluate ecological conditions within the area of influence. Identified experienced river captains to provide a platform for sediment, surface water, and fish collection in the high flow waters of the Mississippi River. Working under extremely difficult conditions, the team adapted standard still water sampling methods to the high flow waters. Managed data evaluation and authored risk assessment report.

Assisted the Science Advisory Board for Contaminated Sites (SAB), in British Columbia, Canada with the development of a Screening Risk Assessment (SRA-Level 1) Guidance. The document focused on determining whether further assessment was required at a site at which contaminant concentrations exceeded screening standards. Specifically, the guidance focused on determining whether any complete exposure pathways and/or receptors were present on the site and required further review. The guidance used a decision-tree approach.

Provided input to the USEPA National Center for Environmental Assessment (NCEA) design team for Causal Analysis/Diagnosis Decision Information System (CADDIS) regarding development of a conceptual modeling tool. Participated in a number of reviews and discussions regarding key components of the program.

Authored portions of the Army Corps of Engineers' Upland Testing Manual (UTM). Developed a case study demonstrating the key concepts within each chapter of the manual. Developed figures, organized, and reviewed the document.

Linda M. Ziccardi
Senior Scientist

Years of Experience: 19 years

Credentials and Professional Honors

B.S., Natural Resource Management and Applied Ecology, Cook College of Rutgers University, 1985

Graduate courses in environmental science, aquatic toxicology, water law, and natural resource management at Rutgers University

Professional Profile

Ms. Linda Ziccardi is an ecologist with 19 years of experience evaluating environmental impacts at industrial and development sites nationwide. Her particular expertise is conducting ecological risk assessments for chemically impacted sites in compliance with CERCLA. Her projects have included fish, wildlife, and vegetation baseline assessments, bioaccumulation studies, and quantitative risk analyses. Ms. Ziccardi performs bioenergetics-based food chain modeling and ecotoxicological analyses to evaluate risks to wildlife from contaminant exposure. She has participated in regulatory negotiations on risk assessment issues on behalf of industry, and has also provided technical support for ecological risk assessments conducted for USEPA and the U.S. Departments of Energy and Defense. Ms. Ziccardi has served on USEPA biological technical assistance groups, has co-authored several publications, and has presented papers on ecological risk assessment at professional society meetings. She recently served on USEPA work groups that are working toward development of ecological risk-based soil screening levels and a framework for metals risk assessment.

Examples of Relevant Project Experience

Managed several ecological risk assessments within USEPA Region 5. For example, she was the manager for the ecological risk assessment that was conducted as part of the RCRA facility investigation for a former automobile assembly plant in Lordstown, Ohio. This project utilized the tools for streamlining ecological risk assessments at RCRA corrective action facilities for sites within Region 5 developed by Exponent. She designed and directed field activities to collect fish, invertebrates, surface water, and sediment to characterize exposure to wildlife receptors foraging at stormwater detention ponds on the facility. Chemicals of concern at this site included metals and PAHs. The ecological risk assessment process involved negotiations with the regulatory agencies, and USEPA accepted the final ERA with a no further action decision for the facility with regard to ecological risk.

Conducted ecological site characterizations and preliminary risk analyses for Middleground Landfill in Bay City, Michigan. Managed the RCRA ecological risk assessments for active industrial facilities at several other Region 5 sites in Ohio and Michigan, incorporating the tools for streamlining ecological risk assessments at RCRA corrective action facilities developed by Exponent. Work at these sites involved mapping vegetation cover types and wildlife habitats, sampling fish, invertebrates, surface water, and sediment, and identifying potential exposure pathways, key ecological receptor species, and contaminants of concern. Developed work plans and cost estimates to perform ecological site characterizations, threatened and endangered species consultations, and bioaccumulation modeling for petroleum hydrocarbons, metals, and PCBs in terrestrial and aquatic environments.

Managed the high-profile ecological risk assessment of PCBs in the Lower Fox River and Green Bay, Wisconsin, for a group of pulp and paper companies. Ecological receptors that were investigated included fish, passerine birds, piscivorous birds, and mink. Information from a detailed habitat characterization was used to quantify exposure areas for each of the wildlife receptors. An extensive field investigation was conducted including sampling of fish, invertebrates, sediment, and surface water from more than 39 miles of the Fox River and the lower half of Green Bay. Risk conclusions were drawn based on the synthesis and analyses of data regarding the ecological and physical conditions of the system, available population studies of key receptors, and site-specific and literature-derived toxicological information. This project was unique in that it used both a dioxin toxic equivalency (TEQ) approach and a spatially explicit exposure assessment using a GIS to assess risks to wildlife from PCBs.

Also in Wisconsin, designed and conducted field investigations at the Oconomowoc Electroplating Superfund site in Ashippin. Performed geostatistical data analyses using existing sediment analytical data and developed a sampling plan for the assessment of a freshwater marsh that was impacted by cyanide and metals from the facility's outfall. This project included collection of surface water and sediment samples for chemical analyses and bioassays.

At a former manufactured gas plant in New York, served as the task leader for fish and wildlife impact analyses. Performed a habitat characterization including covertime mapping, and a threatened and endangered species consultation. The project involved evaluating exposure pathways and contaminant concentrations in surface water and sediment to determine the potential for adverse ecological effects.

Member of the field team for the extent and bioavailability of remaining oil study being conducted as part of the natural resource damage assessment for a large tanker spill in Prince William Sound, Alaska. Sampled fish, bivalves, mollusks, polychaetes, sea weed, crustaceans, and sediment to determine the extent and bioavailability of PAHs in the sediment and biota, and to assess the potential for injury to organisms at higher levels of the food chain. Data from these studies are being used in the ongoing natural resource damage assessment for this high-profile petroleum spill.

Susan Kane Driscoll
Managing Scientist

Years of Experience: 19 years

Credentials and Professional Honors:

Ph.D., Environmental Sciences, University of Massachusetts, 1994
B.S., Natural Resources, University of Rhode Island, 1981

Co-author of the HERA Integrated Risk Assessment Paper of Year, 2002

Kane Driscoll, S.B., W.T. Wickwire, J.J. Cura, D.J. Vorhees, C.L. Butler, D.W. Moore, and T.S. Bridges. 2002. A comparative screening-level ecological and human health risk assessment for dredged material management alternatives in New York/New Jersey Harbor. Hum. Ecol. Risk Asses. 8(3):603–626.

Professional Profile

Dr. Susan Kane Driscoll is a Managing Scientist in Exponent's EcoSciences practice. She is an aquatic toxicologist, with 19 years of experience in toxicology, specializing in ecological risk assessment, environmental chemistry, sediment toxicity testing, and the toxicity and bioavailability of sediment-associated contaminants to aquatic organisms and wildlife.

Dr. Driscoll has directed or participated in numerous ecological risk assessments for RCRA, Superfund, and hazardous waste sites, serving a variety of industrial, utility, and governmental clients. She has extensive experience in designing and conducting laboratory and field aquatic toxicity and environmental fate studies in accordance with rigorous quality assurance practices. She has designed and contributed to numerous environmental programs that were used to develop technically defensible solutions to environmental problems and has negotiated their acceptance with state and federal authorities.

Dr. Driscoll is a specialist in the field of sediment toxicology and her original research and publications in the areas of bioavailability and toxicity of sediment-associated contaminants are widely cited. She has extensive knowledge of sediment toxicity testing, the technical basis and predictive ability of various sediment quality benchmarks, and has served as a reviewer for the development of emerging benchmarks.

Examples of Relevant Project Experience

Managed an ecological and human health risk assessment for a RCRA site in Taunton, Massachusetts. Designed extensive sampling and sediment toxicity testing program that demonstrated minimal impact to aquatic organisms and wildlife from exposure to PCBs, mercury, and dichlorobenzenes in surficial sediments.

Conducted research for the Electric Power Research Institute and its utility members on the application of the EPA equilibrium partitioning sediment benchmarks for PAH mixtures to contaminated sediments at manufactured gas plant sites. Research examined influence of various forms of “black carbon,” including coal tars and coke, on reducing bioavailability and toxicity of PAHs in sediment to aquatic organisms.

Provided technical assistance to client in the development of a standardized risk assessment approach for sediments at MGP sites in Wisconsin. Prepared technical information used by client in discussions with various regulatory agencies, including Wisconsin Department of Natural Resources and USEPA Region 5.

Selected Publications and Technical Reports

Kane Driscoll, S.B., and R.M. Burgess. 2007. An overview of the development, status, and application of Equilibrium Partitioning Sediment Benchmarks for PAH mixtures. *Hum. Ecol. Risk Assess.* 13: 286-301.

Kane Driscoll, S.B., C.B. Amos, M.E. McArdle, B. Southworth, C.A. Menzie, and A. Coleman. 2004. Sediment biotoxicity at former MGP and coking sites. Prepared for Electric Power Research Institute (EPRI), Palo Alto, CA, New York State Electric & Gas Corporation, Binghamton, NY, Central Hudson, Poughkeepsie, NY, and PSEG Services, LLC, Newark, NJ.

Kane Driscoll, S.B., M.E. McArdle, M.S., C.A. Menzie, T. Thompson, L. Mortensen, and A. Fitzpatrick. 2003. Using polycyclic aromatic hydrocarbons in sediments for judging toxicity to aquatic life: Volume I and II. Final Report. Electric Power Research Institute (EPRI), Palo Alto, CA.

Selected Presentations

Kane Driscoll, S.B. A methodology for deriving a dietary dose of PAHs that is protective of fish. Platform presentation, International Conference on Remediation of Contaminated Sediments in Savannah, GA, January 22–24, 2007. Session chair: “Bioavailability of Contaminants.”

Kane Driscoll, S.B., C.A. Menzie, M.E. McArdle, and A. Coleman. 2004. Application of site-specific equilibrium partitioning sediment benchmarks for PAH mixtures to manufactured gas plants. 25th Annual Meeting of SETAC North America, Portland, OR, November 14–18, 2004.

Kane Driscoll, S.B., M.E. McArdle, C.A. Menzie, T. Thompson, and A. Coleman. 2003. Application of sediment quality guidelines for PAHs to manufactured gas plants. 2nd International Conference on Remediation of Contaminated Sediments, Venice, Italy, 2003.

Kane Driscoll, S.B., and C.A. Menzie. 2003. Using NIMO/GTI project results in decision making at MGP sites. Invited Speaker, Conference on Research to Develop Environmentally Acceptable Endpoints for Impacted Sediments and Groundwater at MGP Sites, Syracuse, NY, 2003.

Lisa J. Yost, M.P.H., DABT
Managing Scientist

Years of Experience: 30 years

Credentials and Professional Honors

M.P.H., Environmental and Industrial Health, University of Michigan, 1980
B.S., Botany, Miami University, 1977

Diplomate, American Board of Toxicology (1990 to present)
Hazardous Waste Operations and Emergency Response 40-hour training program
Hazardous Waste Operations Management and Supervisor 8-hour training program

Professional Profile

Ms. Lisa Yost is a Managing Scientist in Exponent's Health Sciences practice and is based in St. Paul, Minnesota. She is a board-certified toxicologist with expertise in evaluating human health risks associated with substances in soil, water, and the food chain. She has conducted or supervised risk assessments under CERCLA, RCRA, or state-led regulatory contexts involving a wide range of chemicals and exposure situations. Ms. Yost assists clients in negotiating with regulatory agency representatives or other parties to resolve issues related to human exposure to toxic substances. She seeks to develop and apply sound technical approaches that realistically characterize potential risk and meet clients' environmental and business objectives. Her particular areas of specialization include exposure and risk assessment, risk communication, and the toxicology of chemicals such as PCDDs and PCDFs, PCBs, pentachlorophenol (PCP), trichloroethylene (TCE), mercury, and arsenic.

Examples of Relevant Project Experience

Currently coordinating the HHRA efforts of a project team addressing PCDD/F, PAHs, and other chemicals of potential concern under Michigan Department of Environmental Quality lead in Region 5. Helped to develop the site-specific risk assessment work plan for both a screening level deterministic assessment and a comprehensive probabilistic HHRA. In this work, she evaluated exposure and biomonitoring data collected by the University of Michigan and worked with the project team to incorporate relevant elements into the work plan approach.

Worked on two relevant projects in Wisconsin and another in Illinois. In the first Wisconsin project, served as senior technical reviewer and manager of an air modeling runs and consideration of exposure pathways related to estimated air releases of PCDD/Fs at the French Island Generating Plant in LaCrosse, Wisconsin. Helped identify project scope, reviewed all project deliverables and worked with Exponent's air modeler on describing model outcomes for the client. In the second Wisconsin project, retained to assist Wisconsin Energy Corporation staff and their consultants to develop an analysis of potential exposures and risks, if any, related

to sulfates in a quarry used for swimming. Participated in calls with client representatives and discussed possible means to compare any potential exposures and risks to standards (e.g., consumption of drinking water at the secondary standard, or swimming in the ocean, which has elevated sulfates relative to surface water) and discussed sulfate toxicological studies. This work was directed toward developing materials to address potential questions from the public or the press. In Illinois, provided assistance in evaluating significance of offsite air concentrations related to a former MGP in Barrie Park. Issues included the degree of site-related versus background input for contaminants of potential concern.

Served as lead toxicologist at a former MGP with residual petroleum hydrocarbons in soil and groundwater in Oregon. The site was undergoing investigation and risk assessment under regulatory guidelines identified by the Oregon Department of Environmental Quality (DEQ). Conducted comprehensive exposure pathway analyses, including the evaluation of the potential for cross-media contamination, and identified limited exposure potential. Worked with the Exponent project team in negotiating with DEQ.

Managed a project to develop risk-based cleanup levels for a former bulk fuel terminal in Seattle, Washington. Worked with a team of contractors to develop a cost-effective approach that was protective of public health and the environment. Selected approach was based on toxic constituents of petroleum hydrocarbons (i.e., benzene, toluene, ethylbenzene, xylene, and PAHs) rather than total petroleum hydrocarbons and greatly reduced areas identified as requiring cleanup. Presented the approach to risk assessment for the site at meetings with the Washington State Department of Ecology.

Provided technical oversight, toxicological review, and risk communication support on a risk assessment conducted as part of an environmental impact statement in development of a refinery in Fjardaal, Iceland. In this context, helped to develop the risk assessment approach to apply air model estimates and evaluate all potential human health pathways related to release of PAHs, SO₂ and fluoride from the plant. Assisted the client in presenting the approach to the Icelandic regulatory board and in crafting risk communication materials to be used for the public.

Served as part of an Exponent team providing technical support on a comprehensive risk assessment of multiple chemicals including PCBs and PAHs in sediments within an industrialized area in Seattle, Washington, along the Duwamish River. Issues included the identification of likely exposure pathways for area residents and visitors, consumption rates for fish and shellfish, and the sustainability of resource consumption as assumed by USEPA.

Managed an upland investigation for a former pulp and paper mill in Ketchikan, Alaska, where Exponent scoped and completed a focused sampling effort for a fast-track site characterization and risk assessment conducted under USEPA and state oversight. Supported negotiations with agency project managers to apply a decision-framework approach to the investigation, including use of source material sampling to focus on limited chemicals and areas of concern; accurate characterization of offsite sources of PCDDs and PCDFs, PAHs, and arsenic; appropriate comparisons with background concentrations for metals and PCDDs and PCDFs; and use of realistic exposure estimates in risk estimates. Represented our client in numerous public meetings and meetings with USEPA and state regulators.

Colleen A. Cushing
Senior Scientist

Years of Experience: 14 years

Credentials and Professional Honors:

B.S., Mathematics and Philosophy, Willamette University, Salem, Oregon (*magna cum laude*),
1988

Professional Profile

Ms. Colleen Cushing is a Senior Scientist in Exponent's Health Sciences practice based in the Chicago office, with 14 years of experience in human health risk assessment and data analysis. Ms. Cushing is experienced in conducting multi-pathway human health risk assessments of industrial, residential, and recreational scenarios, using site-specific data from soils, groundwater, and surface water for both organic and inorganic chemicals. To evaluate potential subsurface vapor intrusion of volatile and semivolatile chemicals, she has used USEPA's Johnson and Ettinger vapor intrusion model. She has presented results of risk assessments to state and federal regulators and stakeholders. She is also experienced in conducting assessments for consumer products and children's health, often involving novel exposure pathways. She has conducted an exposure assessment for a brominated flame retardant under USEPA's pilot Voluntary Children's Chemical Evaluation Program (VCCEP), which included an evaluation of breast milk ingestion, and the use of biomonitoring data and a pharmacokinetic model. She also evaluated children's potential risk from CCA-treated wood and one of its replacement projects ACQ-treated wood, which included estimating potential intake from residue on the wood surface. In her assessments, she has incorporated results from air dispersion models and the Integrated Exposure and Uptake Biokinetic model for children's lead exposures.

Examples of Relevant Project Experience

Managed project and prepared a screening-level health-based assessment of potential exposures to volatile and semivolatile organic compounds associated with a former manufactured gas plant. Exposure scenarios included a daycare center, a recreation center, future residential development, and future construction workers. Data for groundwater and soil were compiled into a relational database from 14 existing reports. Followed procedures outlined in USEPA's Risk Assessment Guidance for Superfund Sites and their most current guidance for evaluating the vapor intrusion pathway. Assessment included a scenario and pathway-specific six-step screening process to refine the list of chemicals of interest, to streamline any future assessment work. Presented results to a stakeholder group and USEPA regulator.

Managed project and prepared a human health risk assessment for a site impacted by historical commercial use of chlorinated solvents. Used USEPA's Johnson and Ettinger vapor intrusion model to assess subsurface vapor intrusion modeling of volatile and semivolatile compounds

under both a hypothetical future commercial building scenario and the planned commercial building scenario. Negotiated with state regulators to gain approval for a rapid, focused soil removal, and to facilitate an expedited review of submitted documents. Oversaw preparation of a comprehensive data validation report and ecological assessment of the site. Prepared a site management plan that incorporated minor modifications to the planned building and groundwater monitoring.

Performed a human health risk assessment of as part of a remedial investigation and feasibility study (RI/FS) for an electronics site in Ohio. Media evaluated included soils, sediments, sludge, groundwater, and surface water. Chemicals of interest included metals and polycyclic aromatic hydrocarbons (PAHs). Aggregated data from multiple sampling events for use in both the human and ecological assessments, and assessed potential risks for current onsite workers and offsite recreational visitors, as well as hypothetical future residents.

Assessed potential human health risks associated with emissions of chemicals from a coal-fired power plant reported by a local utility company under the Toxic Release Inventory (TRI). Estimated air concentrations to which receptors might be exposed using the results of air dispersion modeling combined with TRI emissions data, then compared potential exposures to risk-based screening levels.

Currently coordinating an internal team tasked with evaluating potential human exposures. To meet tight client deadlines, assembled a team consisting of 34 staff members in 11 offices from five different practices. Used internal company IT resources and programming capabilities (at no cost to the client) to convert thousands of single-page image files into a usable electronic format. Efficiency, cost-effectiveness, and product quality was maintained by using technologies such as web-based teleconferencing and real-time sharing of electronic files, the development of comprehensive instructions, and establishing a system of internal review and quality control.

Conducted a human health risk assessment for a former mining site. Assessed potential risks to recreational visitors and construction workers from lead and arsenic. Incorporated results from the adult lead model, and evaluated both chronic and subchronic exposures to arsenic. Assessment included consideration of site-specific conditions such as snow cover, steep terrain, and limited access.

Conducted risk calculations for a multipathway risk assessment for a river in West Virginia that involved evaluation of risks associated with exposures to chemicals in recreational and occupational scenarios. Compiled analytical data for sediments and surface water, modeled fish-tissue concentrations using a bioconcentration factor, and derived exposure-point concentrations for both organic and inorganic substances present onsite. Developed a linked spreadsheet to manipulate toxicity information, exposure algorithms, and exposure-point concentrations and estimate risks for the multi-pathway risk assessment. Quantitatively estimated risks associated with the consumption of fish, inadvertent ingestion of onsite sediments, and dermal contact with onsite sediments and surface water.

C. Bennett Amos
Scientist

Years of Experience: 4 years

Credentials and Professional Honors:

B.S., Environmental Science, University of Massachusetts, 2002
A.S., Environmental Science Technology (with honors), Holyoke Community College, 2000
OSHA Certified Eight-Hour HAZWOPER Annual Refresher Training in Hazardous Waste Operations and Emergency Response, updated annually
Phi Theta Kappa National Honors Society

Professional Profile

Mr. Bennett Amos is a Scientist in Exponent's EcoSciences practice. He has 4 years of experience in evaluating the exposure and effects of contaminants in aquatic and terrestrial ecosystems. He is an environmental scientist focusing on aquatic and terrestrial ecological risk assessment. He has experience in environmental consulting for state, federal, and private sector clients in support of Superfund, MCP, NRD, and litigation projects. His expertise is in ecological risk assessment and the design and implementation of field investigations involving the sampling of soil, sediment, surface water, and biota. Mr. Amos is capable in literature review, research, data management, GIS mapping, research and development, and technical writing.

Prior to joining Exponent, Mr. Amos worked at Menzie-Cura & Associates, Inc., where he gained his experience in ecological risk assessment. Prior to his work with MCA, he worked as a field biologist for a pesticide consulting firm, was responsible for the day-to-day operation of a drinking water analytical laboratory, and assisted in MA Title V inspections, percolation testing, soil profiling, gravel pit exploration, lot surveying, and artificial wetland construction.

Examples of Relevant Project Experience

Led and assisted the design and implementation of numerous sediment, soil, surface water, and biota sampling efforts, including organizing with laboratories, subcontractors, and personnel from multiple offices. Several of these projects were in support of USEPA-led RCRA programs.

Assisted in sampling of sediments at a former coking facility in New Jersey. The field program included sediment reconnaissance and real-time field PAH analysis to allow for the sampling of a range of target analytes. Assisted in the analysis of chemical, physical, and toxicological data generated from this event, and the preparation of the associated technical report to the client.

Designed and implemented the sampling of sediments at two former MGP facilities on the Hudson River. Organized internal and subcontractor personnel for the field sampling effort. Assisted in the sampling of sediments, analysis of chemical, physical, and toxicological data, and preparation of the technical report for delivery to the client.

Designed and implemented the sampling of sediments at a former MGP facility in northern Indiana. Organized the logistics of shipping equipment and moving personnel to the site, and organized local subcontractors to assist in the sampling. Performed the sediment sampling. Assisted in the analysis of chemical, physical, and toxicological data, and prepared the technical report for delivery to the client, which was added to a larger corrective action report, which will be submitted to USEPA Region 5 and Indiana Department of Environmental Management.

Supported the ecological risk assessment for the settling ponds and spoils disposal area site at Badger Army Ammunition Plant, Baraboo, Wisconsin. Assisted in the development of a master database for the site that incorporated analytical data for soil and biological media from multiple sampling events. Assisted in the development of ecological hazard quotients using food chain models. Continuing to support the ecological risk assessment for this site.

Presentations

Menzie, C.A., B. Amos, and U. Ghosh. A mechanism for delivery of activated carbon to sediment. Fourth International Conference on Remediation of Contaminated Sediments. Savannah, GA. January 22–25, 2007.

Kane Driscoll, S.B., M. McArdle, C.B. Amos, C.A. Menzie, and A. Coleman. 2005. Development of a database of toxic doses of PAHs to fish. Estuarine Research Federation 2005 Conference, Norfolk, VA, October 16–20, 2005.

Kane Driscoll, S., B. Amos, M. McArdle, C. Menzie, and A. Coleman. Application of equilibrium partitioning sediment benchmarks (ESBs) for PAH mixtures to manufactured gas plant sites. Poster presentation, Society for Risk Analysis Roundtable Discussion of Emerging and Still Urgent Issues in Risk Analysis, July 14, 2004.

von Stackelberg, K.E., C. Butler, J. Famely, B. Amos. 2004. Risk management for threatened and endangered species at US Army Installations. Society For Risk Analysis Annual Meeting, December 5–8, 2004.

Menzie, C.A., B. Amos, and M.L. Nelson. 2003. Relying on natural or enhanced benthic biological barriers for reducing exposure to sediment contamination. Poster presentation, EPRI In-situ Contaminated Sediment Capping Workshop, Cincinnati, OH, May 12–14, 2003.

Joseph J. Famely
Scientist

Years of Experience: 6 years

Credentials and Professional Honors:

A.B., Psychology and Environmental Sciences (*magna cum laude*), Bowdoin College, 2000

Professional Profile

Mr. Joseph J. Famely is a Scientist in Exponent's EcoSciences practice. He has 6 years of experience in environmental consulting for state, federal, and private sector clients in support of Superfund, MCP, NRD, and litigation projects. His expertise is in ecological risk assessment, the design and management of complex databases, GIS mapping, and the design and implementation of field investigations. He has extensive field experience collecting soil, sediment, surface water, and biota and using water quality meters.

Prior to joining Exponent, Mr. Famely performed ecological and human health risk assessments, led field investigations, and provided litigation support at Menzie-Cura & Associates. There, he conducted numerous literature searches in the areas of biological fate and effects, and regulatory analysis, and regularly provided statistical support for exposure and risk calculations.

Examples of Relevant Project Experience

Provided field, database, and risk assessment support for a former MGP site in Salem Harbor, Massachusetts (Collins Cove MGP Site). For National Grid (formerly Massachusetts Electric Company), implemented a multi-year sediment biomonitoring program to evaluate changes in the benthic community following *in situ* treatment application – nutrient injection. Under the Massachusetts Contingency Plan (MCP), implemented a multi-media field program (terrestrial, wetland, aquatic) and supported the ecological risk assessment. In addition to toxicological benchmark research, toxicity reference value research, bioaccumulation model implementation and food chain model implementation, managed and manipulated a large database to support both human health and ecological risk calculations.

Supported the development of a risk assessment framework document for Wisconsin Public Service Corporation's former MGP sites. The work included developing screening tables to be used in the ecological and human health screening evaluations.

Performed a sediment screening assessment for a former MGP site in Ripon, Wisconsin. The analysis included a sediment screening following Wisconsin DNR guidelines and USEPA guidance on Equilibrium Partitioning Sediment Benchmarks (ESBs) for the protection of benthic organisms.

Performed a sediment screening assessment for a Nicor Gas former MGP site in Illinois. The analysis included a sediment screening following USEPA guidance on ESBs for the protection of benthic organisms.

Provided database support services for the baseline ecological risk assessment of the Badger Army Ammunition Plant (BAAP) Site in Sauk County, Wisconsin. BAAP is a RCRA site with USEPA Region 5 oversight.

Provided research support in an environmental forensics case at a landfill at the Sauget Area II Superfund site in Cahokia, Illinois.

Provided field and risk assessment support for the W.R. Grace Acton Plant Superfund site in Acton, Massachusetts.

Provided modeling support for an assessment of bioaccumulation of PCBs in fish at the Hudson River Superfund site for USEPA Region 2.

Cheri L. Butler
Project Team Member

Years of Experience: 10 years

Credentials and Professional Honors:

B.A., Biology, College of the Holy Cross, 1997

Co-Author of the HERA Integrated Risk Assessment Paper of Year, 2002.

Kane Driscoll, S.B., W.T. Wickwire, J.J. Cura, D.J. Vorhees, C.L. Butler, D.W. Moore, and T.S. Bridges. 2002. A comparative screening-level ecological and human health risk assessment for dredged material management alternatives in New York/New Jersey Harbor. Hum. Ecol. Risk Asses. 8(3):603–626.

Professional Profile

Ms. Butler has 10 years of experience evaluating aquatic and terrestrial exposure and effects of contaminants in the environment. Her experience conducting human health and ecological risk assessments includes development of quality assurance project plans, design and implementation of multi-media field sampling programs, development of conceptual models and human exposure profiles, preparation of final risk characterization reports, and development of preliminary remediation goals. She is also skilled in database design, management, and quality control. Ms. Butler is familiar with approaches for evaluating petroleum hydrocarbons and with probabilistic risk assessment methods. She has contributed to the development of a probabilistic framework for evaluating the suitability of dredged material for disposal. She is currently conducting risk assessments under the Superfund program.

Examples of Relevant Project Experience

Ms. Butler has provided risk assessment support at MGP sites and sites in Wisconsin and Indiana. She contributed to the development of a risk assessment framework document for Wisconsin Public Service Corporation's former MGP sites. She also provided risk assessment support for the engineering evaluation/cost analysis for the St. Augustine Former MGP Site in St. Augustine, Florida, and for the feasibility study for Site 11 (Open Burning Unit) at Jefferson Proving Ground (JPG) in Madison, Indiana. The purpose of the streamlined risk evaluation performed at the St. Augustine Site was to identify areas that required remediation as well as guide the selection of types of remediation appropriate for those areas. Similarly, at JPG, Ms. Butler conducted a human health risk assessment (HHRA) and ecological risk assessment (ERA) screening evaluation that was used to streamline the selection of the remediation area at Site 11. At Badger Army Ammunition Plant (BAAP) in Baraboo, Wisconsin, Ms. Butler used recent data to re-evaluate potential ecological risks for wildlife that may use the Final Creek, Settling Ponds, and Spoils Disposal Areas Site.

Ms. Butler has also completed numerous multimedia risk assessments in accordance with CERCLA and RCRA Corrective Action program. Two of these assessments were conducted for USEPA-led NPL sites. Ms. Butler was part of a team of scientists working along with USEPA to design a sampling plan to collect data suitable for risk assessment, conduct human health and ecological risk assessments, and develop preliminary remediation goals.

Margaret A. Zak
Senior Scientist

Years of Experience: 28 years

Credentials:

M.S., Coursework in Toxicology, University of Pittsburgh, 1987–1989

M.S., Ecology, Pennsylvania University, 1984

B.B., Biology/Chemistry, University of Pittsburgh, 1978

Professional Profile

Ms. Margaret Zak has more than 28 years of environmental experience in the industrial, consulting, government, and non-profit sectors. Her experience includes: project management of major industrial projects, preparation of sampling and analysis plans and investigation/remediation reports, management and implementation of human health and ecological risk assessments, and project cost tracking and scheduling.

Ms. Zak has been involved in the human health and ecological risk assessment process, both from a management and implementation perspective, since 1990. Her human health and ecological experience includes: development of upfront corporate strategies and presentation of these strategies in a risk methodology document for regulatory review and approval, development of risk-based sampling and analysis plans, development of site-specific conceptual site models, development of site-specific exposure parameters that consider current regulatory guidance, the peer reviewed literature and unique characteristics of a site, and preparation of final risk characterization reports. Ms. Zak is experienced in negotiating with federal and state regulatory agencies in development of sampling and analysis plans, remedial investigation reports, feasibility studies, and remediation plans. The outcome of these negotiations was to develop mutually acceptable methodologies/procedures for the investigation and remediation of sites using technically defensible, risk-based procedures resulting in cost effective remedial solutions.

Examples of Relevant Project Experience

Served as Project Manager/Risk Manager for a Fortune 500 steel company who formerly owned and operated a steel siding facility in Akron, Ohio being investigated under USEPA's RCRA program. Soil and groundwater were the focus of the investigation. Served as the main strategy/review person for the human health and ecological risk assessments that were conducted to determine areas that needed to be remediated. This required numerous strategic negotiations with USEPA Region 5. The risk-based approach resulted in a Record of Decision that required only a monitored natural attenuation program for groundwater, which was a significant cost savings to the PRPs.

Served as Risk Manager on a RCRA corrective action project for a fully integrated steelmaking facility in Gary, Indiana. Developed and managed the human health and ecological risk-based

strategy as part of the RCRA corrective action program. USEPA Region 5 was the agency providing regulatory oversight of the RCRA process. The human health risk methodology developed for this facility involved a unique approach to developing worker-specific exposure parameters for various operating areas of the plant that resulted in minimal areas to be investigated in the Phase II soil investigation. A risk-based perimeter groundwater monitoring approach was proposed to USEPA for the facility.

Served as Project Manager/Risk Manager for a Fortune 500 corporation's former steelmaking facility located south of Chicago, Illinois that was entered into IEPA's voluntary cleanup program in 1993. The project consisted of three phases of site investigation, a human health and ecological risk evaluation, development of risk-based remediation goals, and remediation of the property for industrial/ commercial use. Using a risk-based approach following IEPA's formal risk assessment program, a cost-effective, risk-based remedial solution was implemented. The corporation received a No Further Remediation letter from the IEPA and is currently involved in a joint-venture with another major development entity to develop the site for mixed-used.

Served as Project Manager/Risk Manager on a vessel slip sediment risk evaluation for a Fortune 500 corporation's former steelmaking facility located south of Chicago, Illinois. Developed a risk-based human health and ecological strategy for evaluating sediment results from two vessel slips that were sampled by the IEPA approximately four years ago. A risk strategy document was submitted to the IEPA to evaluate future recreational receptors using the slips for fishing purposes. The strategy focused on the fact that only bioaccumulative chemicals are appropriate to evaluate by modeling their concentrations in sediments to fish that are potentially caught and eaten. The former steel site will be redeveloped in the near future for commercial/residential use with the potential for recreational use along the slips.

Served as Project Manager/Risk Manager for a Fortune 500 corporation's former steelmaking facility, Joliet, Illinois. Managed the human health and ecological risk assessments performed for the former 57-acre former steelmaking facility, as well as served as overall Project Manager. The site was being investigated under IEPA's voluntary Site Remediation Program (SRP). A comprehensive site investigation work plan for soil and groundwater sampling, which included the risk assessment methodology, was submitted to the state for review and approval.

Served as Risk Manager for a Fortune 500 steelmaking company's former steelmaking facility in Duluth, Minnesota. Developed and managed the human health and ecological risk-based strategy as part of the CERCLA program. The site consisted of both an upland portion of property and offshore estuary sediments. Soils and sediments were investigated under a Consent Order issued by MPCA that required submittal of both remedial investigation and feasibility study reports to MPCA, MDH, and USEPA Region 5. Responsible for developing the risk-based strategy that formed the basis of the soil and sediment investigations and negotiating with the regulatory agencies providing oversight of the process. The risk assessment resulted in focused soil remediation in the upland areas of the site and identified areas in the estuary requiring sediment remediation. The project team developed a unique approach to minimizing sediment remediation by engaging the regulatory agencies as well as local trustees (MDNR, USFWS) in developing a habitat enhancement plan to restore native species/habitat without the invasive removal of sediments.

Attachment 2

Project Team Publications

Project Team Publications

Relevant Publications and Presentations

Manufactured Gas Plant Sites and Related Chemicals (PAHs, cyanides, select metals, and hydrocarbons)

Cura, J.J., S.B. Kane Driscoll, R. Lacey, M. McArdle, and C.A. Menzie. 2001. Assessing ecological risks of PAH-contaminated sediments. In: Sediments Guidance Compendium. Electric Power Research Institute (EPRI), Palo Alto, CA.

Harkey, G.A., S.B. Kane Driscoll, and P.F. Landrum. 1997. Effect of feeding in 30-day bioaccumulation assays using *Hyalella azteca* in fluoranthene-dosed sediment. Environ. Toxicol. Chem. 16(4):762–769.

Kane Driscoll, S.B., and R.M. Burgess. In press. An overview of the development, status, and application of Equilibrium Partitioning Sediment Benchmarks for PAH mixtures. Hum. Ecol. Risk Assess.

Kane Driscoll, S.B. 1996. Sediment accumulation and toxicity of fluoranthene to freshwater amphipods. Benthic Ecology Meeting, Columbia, SC, March 7–10, 1996.

Kane Driscoll, S.B. 1998. Invited Participant and Session Leader, U.S. Army Corps of Engineers Workshop on Environmental Risk Assessment and Dredged Material Management: Issues and Application. San Diego, CA, 1998.

Kane Driscoll, S.B. 2007. A methodology for deriving a dietary dose of PAHs that is protective of fish. Platform presentation, International Conference on Remediation of Contaminated Sediments in Savannah, GA, January 22–24, 2007. Session chair: “Bioavailability of Contaminants.”

Kane Driscoll, S.B., and A.E. McElroy. 1993. A comparison of bioaccumulation and biotransformation of benzo[a]pyrene in three species of polychaete worms. Society of Environmental Toxicology and Chemistry, Houston, TX, 1993.

Kane Driscoll, S.B., and A.E. McElroy. 1992. Biotransformation of benzo[a]pyrene by three species of polychaete. Society of Environmental Toxicology and Chemistry, Cincinnati, OH, 1992.

Kane Driscoll, S.B., and A.E. McElroy. 1993. Metabolism of benzo[a]pyrene in three species of marine annelids. Gordon Research Conference on Drug Metabolism, Plymouth, NH, 1993.

Kane Driscoll, S.B., and A.E. McElroy. 1996. Bioaccumulation and metabolism of benzo[a]pyrene in three species of polychaete worms. Environ. Toxicol. Chem. 15:1401–1410.

Kane Driscoll, S.B., and A.E. McElroy. 1997. Elimination of sediment-associated benzo[a]pyrene and its metabolites by polychaete worms exposed to 3-methylcholanthrene. *Aquat. Toxicol.* 39(1):77–91.

Kane Driscoll, S.B., and C.A. Menzie. 2003. Using NIMO/GTI project results in decision making at MGP sites. Invited Speaker, Conference on Research to Develop Environmentally Acceptable Endpoints for Impacted Sediments and Groundwater at MGP Sites, Syracuse, NY, 2003.

Kane Driscoll, S.B., and P.F. Landrum. 1995. Toxicokinetics and critical body burdens of Fluoranthene in amphipod bioassays with *Hyalella azteca* and *Diporeia* sp. Invited talk, Society of Environmental Toxicology and Chemistry, Vancouver, BC, 1995.

Kane Driscoll, S.B., and P.F. Landrum. 1996. Bioaccumulation and critical body burden of Fluoranthene in estuarine amphipods. Society of Environmental Toxicology and Chemistry, Washington, DC, 1996.

Kane Driscoll, S.B., and P.F. Landrum. 1997. A comparison of equilibrium partitioning and critical body residue approaches for predicting toxicity of sediment associated fluoranthene to freshwater amphipods. *Environ. Toxicol. Chem.* 16(10):2179–2186.

Kane Driscoll, S.B., G.A. Harkey, and P.F. Landrum. 1997. Accumulation and toxicity of fluoranthene in sediment bioassays with freshwater amphipods. *Environ. Toxicol. Chem.* 16(4):742–753.

Kane Driscoll, S.B., P.F. Landrum, and E.A. Tigue. 1997. Accumulation and toxicity of fluoranthene in water only bioassays with freshwater amphipods. 1997. *Environ. Toxicol. Chem.* 16(4):754–761.

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Kane Driscoll, S.B., T. Bridges, J.J. Cura, M. McArdle, and M. Nelson. 2002. A review of comparative risk assessment methods and their applicability to dredged material management decisions. 23rd Annual Meeting of SETAC North America, Salt Lake City, Utah, November 16–20, 2002.

Kane Driscoll, S.B., M.E. McArdle, C.A. Menzie, A. Coleman. 2002. Application of sediment quality guidelines of PAHs to manufactured gas plant sites. Presented at the 23rd Annual Meeting of SETAC North America, Salt Lake City, UT, November 16–20, 2002.

Kane Driscoll, S.B., M.E. McArdle, C.A. Menzie, and A. Coleman. 2002. Application of sediment quality guidelines of PAHs to manufactured gas plant sites. Presented at the 23rd Annual Meeting of SETAC North America, Salt Lake City, UT, November 16–20, 2002.

- Kane Driscoll, S.B., M.E. McArdle, C.A. Menzie, T. Thompson and A. Coleman. 2003. Application of sediment quality guidelines for PAHs to manufactured gas plants. 2nd International Conference on Remediation of Contaminated Sediments, Venice, Italy, 2003.
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- Kane Driscoll, S.B., M.E. McArdle, D. Burmistrov, M. Reiss, J.A. Steevens . 2006. A methodology for deriving a dietary dose of total polynuclear aromatic hydrocarbons that is protective of fish. Presented at the 27th Annual Meeting of SETAC North America, Montreal, Canada, November 5–9, 2006.
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Ziccardi, L.M., and D. Bodishbaugh. 2006. Ecological risk screening levels for total petroleum hydrocarbons: A review. Presented at the Society of Environmental Toxicology and Chemistry (SETAC) Annual Meeting. Montreal, Canada.

Other Publications Relevant to Ecological and Human Health Risk Assessment

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Burmester, D.E., K.M. Thompson, C.A. Menzie, E. Crouch and T. McKone. 1990. Monte Carlo techniques for quantitative uncertainty analysis in public health risk assessment. pp. 215–21. In: Proc. 1990 Hazardous Materials Control Research Institute Conference New Orleans, LA, 1990.

Burmester, D.E., C.A. Menzie, J.S. Freshman, J.A. Burris, N.I. Maxwell and S.R. Drew. 1991. Assessment of methods for estimating aquatic hazards at Superfund-type sites: A cautionary tale. *Environ. Toxicol. Chem.* 10:827–842.

Callahan, C.A., C.A. Menzie, D.E. Burmaster, D.C. Wilborn and T. Ernst. 1991. On-site methods for assessing chemical impact on the soil environment using earthworms: A case study at the Baird & McGuire Superfund Site, Holbrook, MA. *Environ. Toxicol. Chem.* 10:817–826.

Cura, J.J. and C. Menzie. 1996. Methodologies for ecological risk assessment: the overall process and recent advances. Presented at the Water Environment Federation 69th Annual Conference & Exposition. Conference Workshop #12 - Ecological Risk Assessment: Why and How—An Important Tool in Environmental Decision Making, Dallas, TX, October 5–9, 1996.

Freshman, J.S., C.A. Menzie. 1996. Two wildlife exposure models to assess impacts at the individual and population levels and the efficacy of remedial actions. *Hum. Ecol. Risk Asses.* 2(3):481-496.

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